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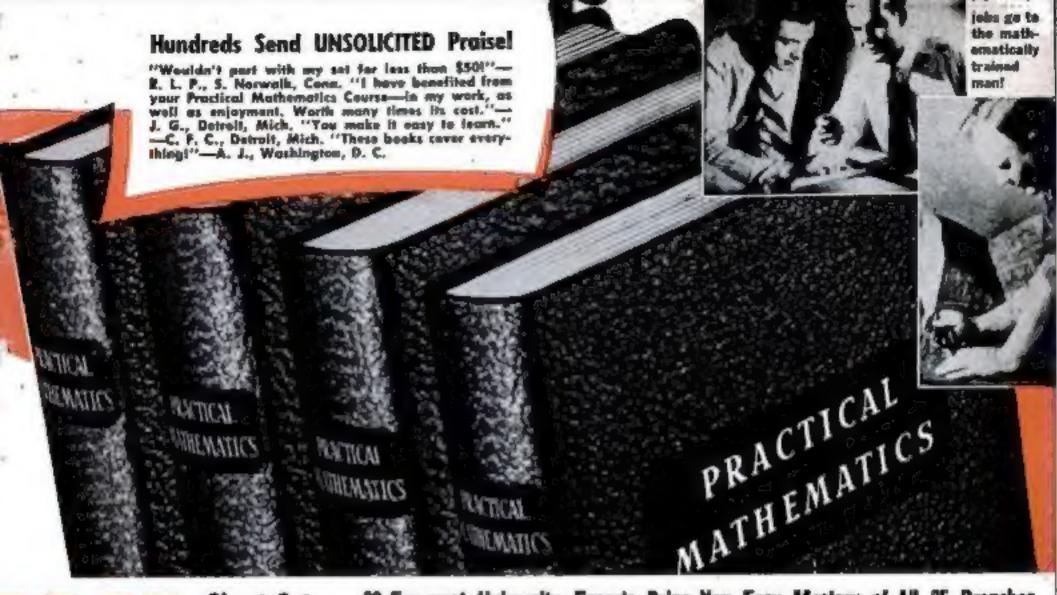
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### Why Do Planes Collide?

Fifty-seven passengers in this airliner (left) and the one that hit it were lucky: all got out alive, But 175 other people have been killed in 34 of 86 other mid-air collisions in the last five years. For a report on possible causes and cures, see "Scientists Tackle Pilots' Deadly Blind Spots"—page 114.

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Average income for all U. S. men	\$3,288.00	\$3,617.00	10%
Average income for college graduates (men)	\$4,227.00	\$5,142.00	20%
Average income for 41 I. C. S. graduates and non-graduates sur- veyed, Jan. '53	\$2,514.63 before I.C.S. training	\$5,114.84 as of Jan. '53	103%

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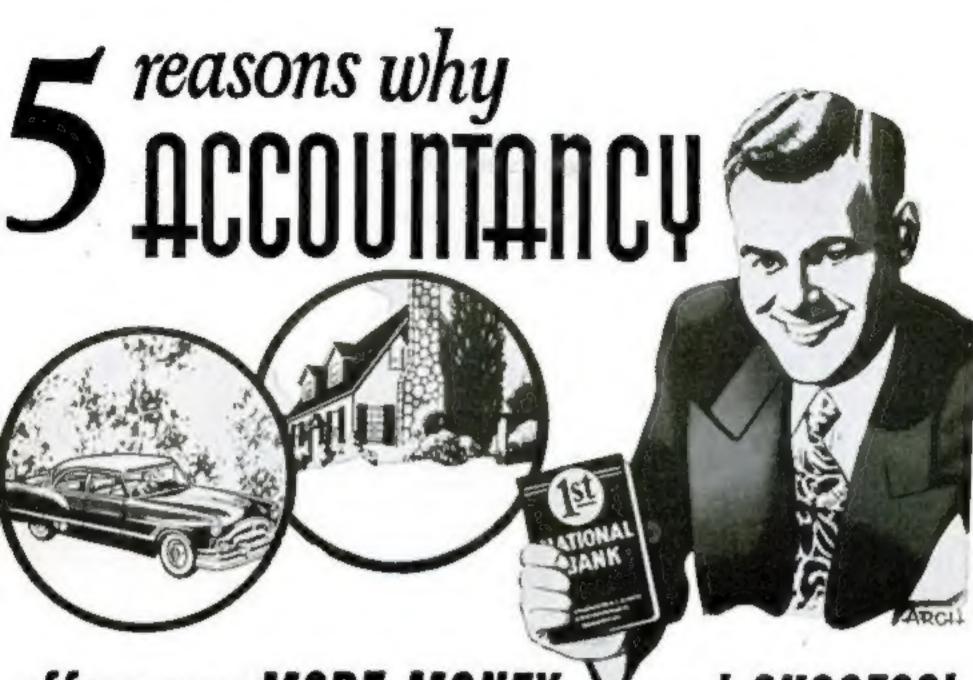
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### NEXT MONTH ... All About Glass



Working with glass is fun, it's rewarding—and it's easier than you think. Populan Science Montine, for February will show you how to cut glass like an expert, do glazing, replace a broken car window yourself and, with a novel electric bottle cutter, turn old bottles into decorative and useful craftwork.



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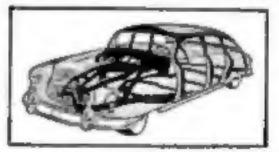
"I have had extremely fine service from all my Nash cars...drove a 1941 Nash Ambassador 256,000 miles and had only one motor overhaul. Drove a 1948 Ambassador 89,000 miles and had no work done on it at all. Traded it in on a '49 Nash which still looked and performed like new at 134,000 miles when I again traded—for a new Nash.

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unit. There are no body bolts to loosen, rattle or squeak. It is twice as rigid, stronger and safer—stays new years longer.

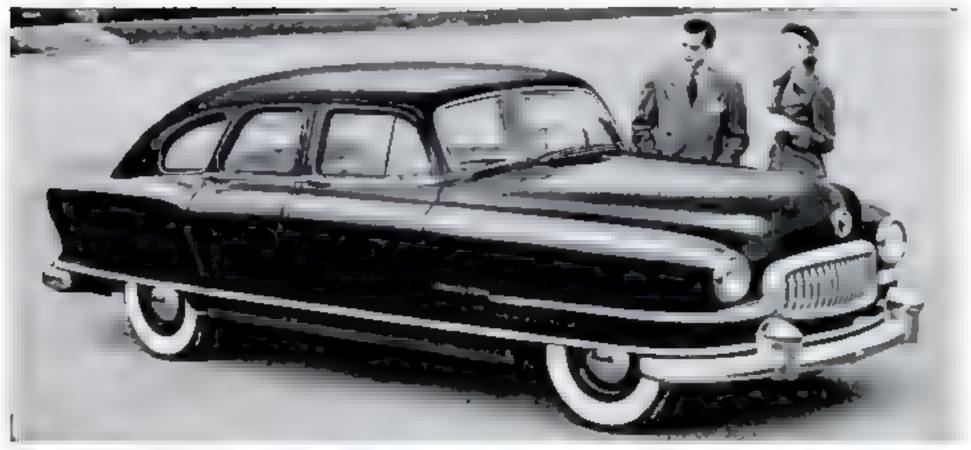
Why do Nash cars seldom need repainting? Unlike other car-makers that use quick-drying

lacquers, Nash employs specially formulated enamels baked to a hard, porcelainlike finish. This durable finish is



"anchored" to sheet metal completely treated with the famous Bonderite rust-proofing process to resist aging, cracking, rusting—to stay beautiful years longer.

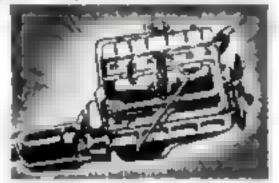
POPULAR SCIENCE



This 1951 Nash is typical of many fine, low-priced used cars on Nash dealers' lots right now!

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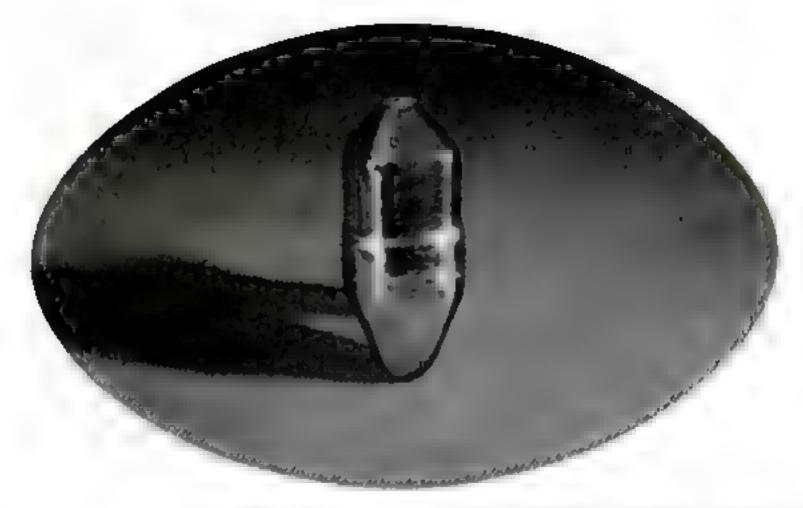
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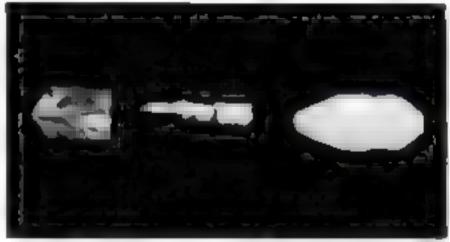


Germanium crystal grown at Bell Telephone Laboratories (half size). It is sliced into hundreds of minute places to make Transistors. Transistor action depends on the flow of positive current-carriers as well as electrons, which are negative. Assenic—a few parts per 100,000,000—added to germanium produces prescribed excess of electrons. With gallium added, positive carriers predominate. Latest junction type Transistor uses both kinds of germanium in the form of a sandwish,

### THEY GREW IT FOR TRANSISTORS

Heart of a **Transistor**—Bell Telephone Laboratories' new pea-size amplifier—is a tiny piece of germanium. If **Transistors** are to do their many jobs well, this germanium must be of virtually perfect crystalline structure and uniform chemical composition. But it doesn't come that way in nature.

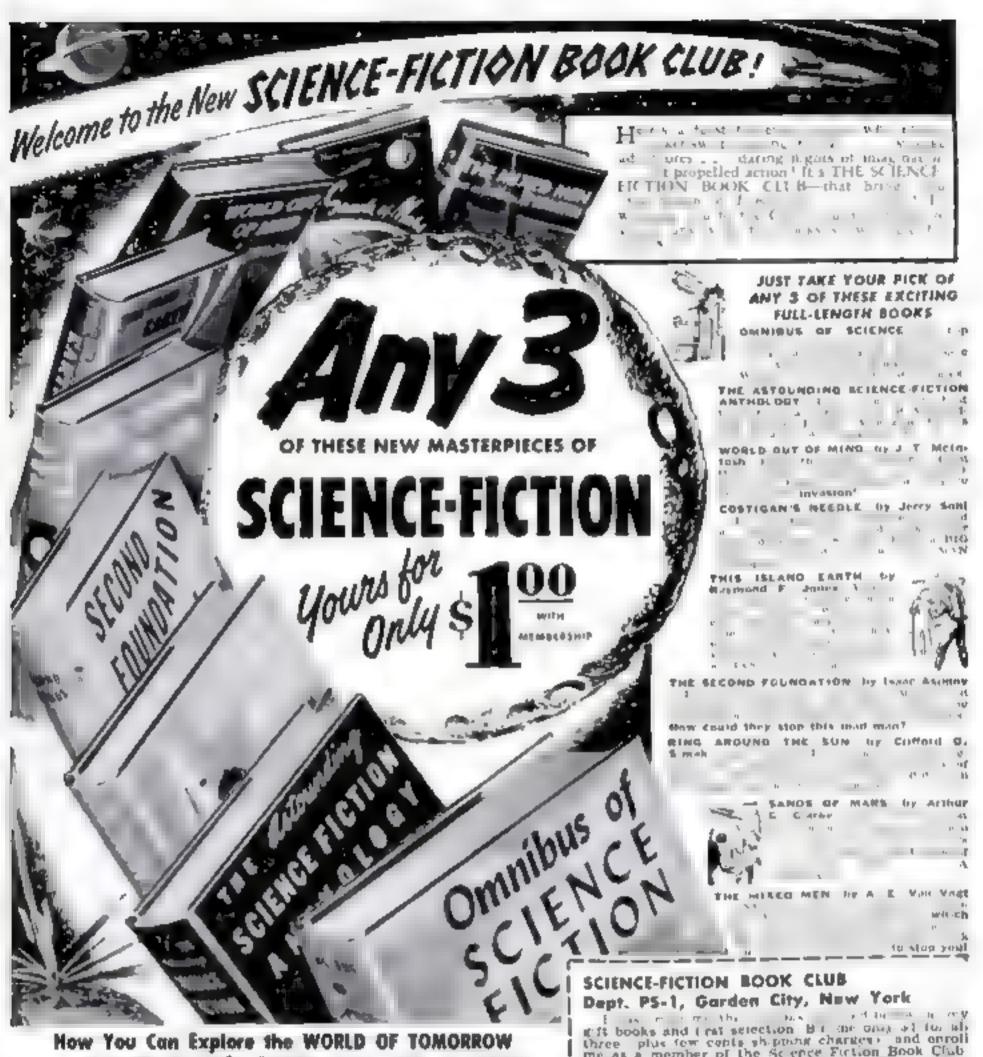
So—Bell scientists devised a new way to grow the kind of crystals they need, from a melt made of the natural product. By adding tiny amounts of special alloying substances to the melt, they produce germanium that is precisely tailored for specific uses in the telephone system. This original technique is another example of the way Bell Laboratories makes basic discoveries—in this case the *Transistor* itself—and then follows up with practical ways to make them work for better telephone service.



Section of natural germanium, left, shows verying crystal structure. At right is sectioned single crystal grown at fall Laboratories.

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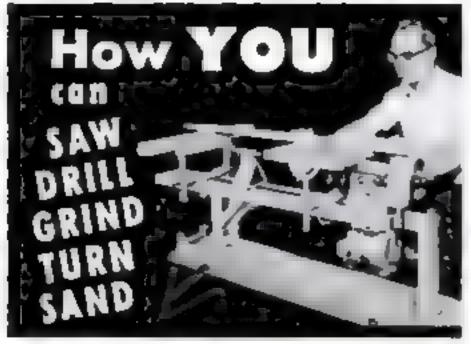
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### **Good Jokes Never Die**

Shame on the judges of your Model T contest for choosing an oldie as the winner! It was told about a locomotive engineer before Henry Ford made his Model T. The engineer was having trouble stopping the locomotive at precisely the right spot in the roundhouse. After he had gone in and backed out repeatedly, his friends began to kid him, and he shouted back, "Well, why didn't you shut the door while I had it in?"

JOSIAH T. BLANK, Council Bluffs, Iowa.

Hummml Well, anyhow—at the request of the Ford Motor Co., the nearly 3,000 Model T anecdotes we received from PSM readers have now been turned over to the Ford Archives at Dearborn, Mich., for permanent preservation as the Popular Science Model T Collection.

### Canadian Tribute to PSM

While your article on the Canadian Postal Service [Dec., p. 116] was written with a very broad sweep, it nevertheless conveys a very true picture of the Service in action at the peak period of the year.

I am also very much impressed by the imagination shown in the treatment de-



cided upon for the pictures. While your readers may be surprised by the innovation, I am sure they will also be pleased and appreciative. I am certain of this because while I feel that the regular reader of POPULAR SCIENCE MONTHLY is a very practical person, he is also an individual who is not very happy in ruts, and he would not be a reader

### INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

### CLARENCE A. O'BRIEN & HARVEY JACOBSON

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says John Grillo

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my over TV set. I have brest saing my lest instruments the end of the course. The lessons on systematic my service work, Three more lessons and my course will be completed. I have been servicing for several months now and have carned much mare than trouble-shooting are especially helpful.

To have training in a field which is proving to be the Mayors field of opportunity for the trained technician gives use confidence and makes the future look bright." JOHN CRILLO, Charlerol, Pa. "I feel so much better now that I know something,

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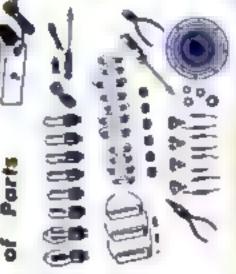
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### INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are your laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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> DAVID ADAMSON, Superintendent Canadian Post Office Dept, Ottawa, Ont.

### Gr-r-r-r-r!

According to Mr. Meyerhoff's own story [Oct., p. 99], the dowsing rod goes down for him. He doesn't know why. He isn't interested enough to investigate, experiment or even wonder—yet he doesn't believe it! He's scared to death he'll find out there's something to it. A lot of folks are like that. They figure if they don't do anything about finding out about things, why, maybe, it just might be that the things would go off and hide and get lost. Well, they won't.

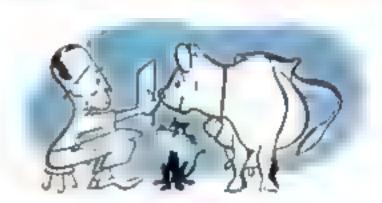
GASTON BURRIDGE, Downey, Calif.

### It Depends on the Cow

On page 132 of your November issue, under "New Ideas from the Inventors," I see a man milking a cow from the wrong side. Yes, there are some cows trained to cooperate thus, but when I used to do the job the right aide was the correct side of approach.

NOBLE E. PERLER, St. Paul.

It still is, for the unimaginative, run-ofthe-mill cow. But, you see, our cow was a



friend of the artist and permitted certain liberties in order to show off the trick stool.

### It Paid Him to Read PSM

I don't need to be sold on your excellent magazine because I have been a constant reader since 1939. At that time I lived in one of the islands of the British West Indies, and during World War II I paid as high as 42 cents (B.W.I. currency) per copy.

However, I made several times what the magazine cost me then by making and selling wooden toys from patterns given in your issues. Toys, as you will remember, were scarce then and anyone with the necessary tools, devoting all of his time to it, could have made a fair income in toymaking. I





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spent my spare hours relaxing at it and made a profit in the bargain.

FRED E. CHAPMAN, Toronto, Ont.

### What Were the Whizzers of '287

I would like to know the names of a few of our 1928 stock cars that could do 100 miles an hour.

WILLIAM TABROSKY, Sharpsburg, Pa.

The Automobile Old Timers Club, which should know, disclaims any knowledge of 1928 cars that would do 100 nules on hour We think probably the Stutz and the Duesenberg could. Anybody else got a candidate?

### Those Silent Landsildes

The article "Moon's Mysteries Challenge Spacemen" in the November issue was tops. However, the article states that a landshide would be awesome to a moon explorer because "it would happen in total silence—



there cannot be enough air on the moon to carry a whisper of sound,"

Since air is not the only medium through which sound will travel, isn't it possible that the sound would be carried through the surface of the moon to the space suit of the observer, and that at least a whisper of a sound would reach his ear?

LLOYD E. PETERMAN, Willow Run, Mich.

A good question, but we think the answer is no. Presumably the quivering of the ground would be perceptible to the moon explorer. But it seems unlikely that vibrations of the frequency range of what we call sound would reach his ears through the feet of his space suit and, moreover, a cushioning layer of rock dust would be everywhere underfoot.

### Keys and Straight Eights

I wish you would call it to the attention of Wilbur Shaw that Hudson, with all due credit to a good old independent manufacturer of excellent automobiles, is not the only one that uses the "round" ignition key. If he will again take a look at a Packard, he





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will find they have round, and not hex, keys. Also-what he said about L-head or sidevalve motors in Hudson goes, but even more so, for Packard-the last perhaps to hold out with high-quality, high-compression simple L-head straight-eight motors that perform right up with the overheads and "V" motors.

L. G. GLENN, M.D., Protection, Kansas.

Score one for Dr. Glenn on round keys. And include Pontiac among the rugged straight eights (see p. 120).

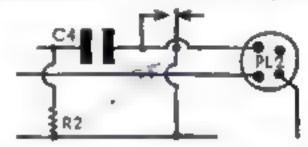
### How to Avoid a Short Circuit

In the circuit for the receiver unit of the radio-controlled tractor described in your August issue [p. 191], no transformer specifications are given. What should I use?

And in the wiring from PL2, wouldn't the connection at the armature of RY3 short it to one of its own points?

DAN BRANISEL, Cleveland, Ohio,

Sharp-eyed reader Branisel is right. There should be a crossover loop at this



noint. The corrected diagram is shown here. A UTC 503 transformer was used in the receiving circuit.

### Credit Where It's Due

There was a picture of me holding some special lenses on page 177 of your October issue. The caption said that I developed these lenses.

While I played a part in the original testing of them, the real developer is Dr. William Fembloom, of Columbia University.

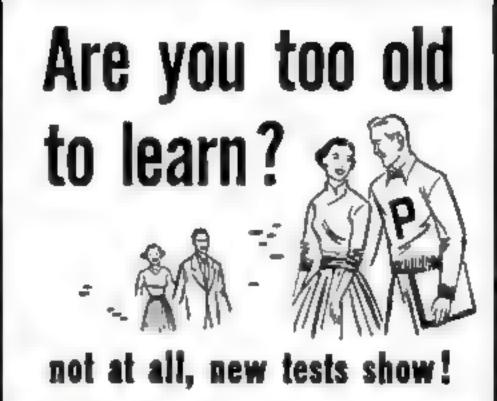
ROBERT GRAHAM, Los Angeles.

### Through Heil's Canyon on Foot

I thoroughly enjoyed reading Richard Neuberger's article "Is Grand Canyon's Rival Deeper?" [Oct., p. 126] for I was one of an eight-man level unit of the U. S. Coast & Geodetic Survey that went through Hell's Canyon of the Snake River on foot during the summer of 1947. Three bateau-type boats were used for transporting our supplies through the canyon. It took us five days to negotiate and survey 20 miles of the canyon on foot.

CAYCE PRESNELL, Wilkesboro, N. C.





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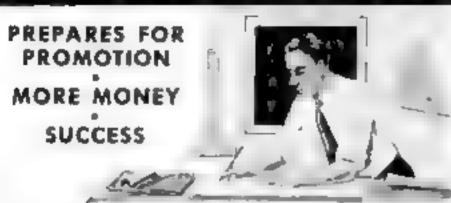
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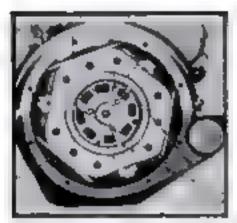


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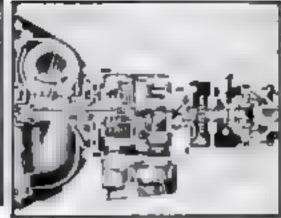
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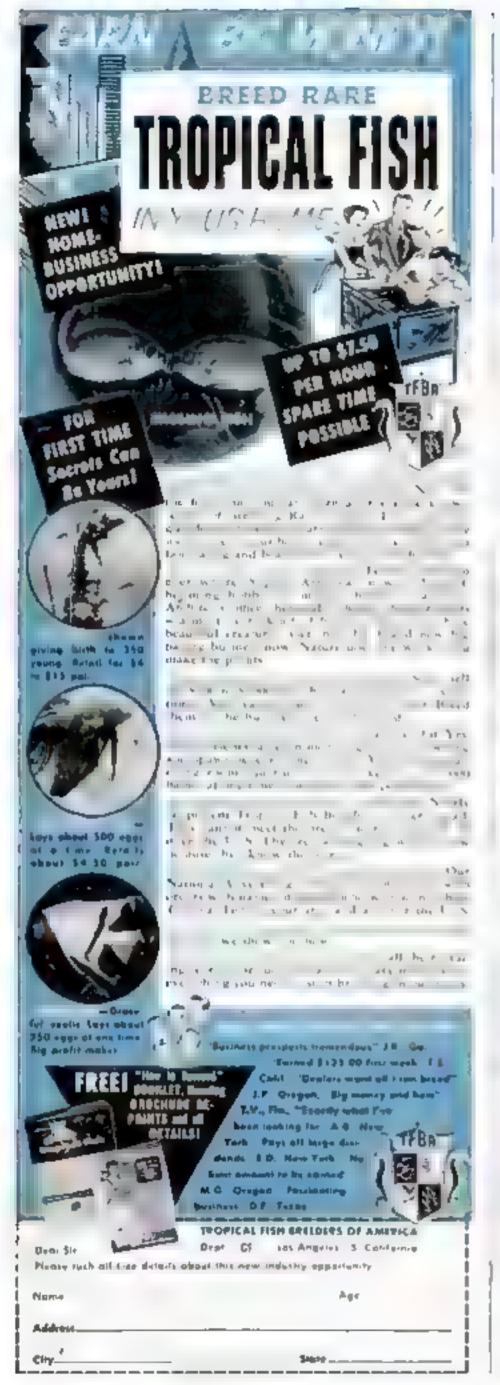
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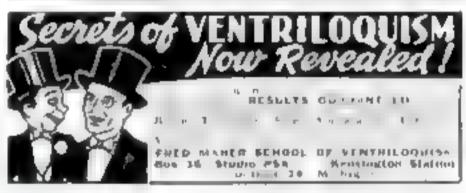
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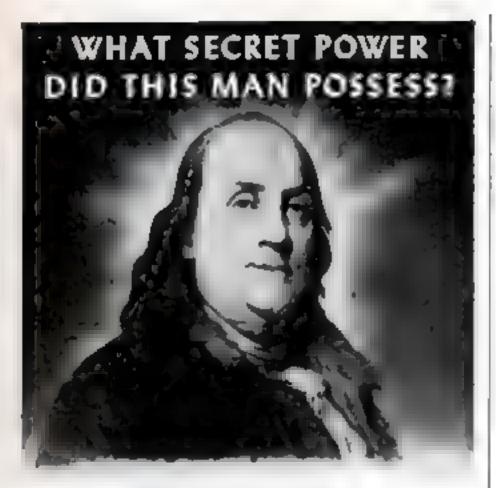


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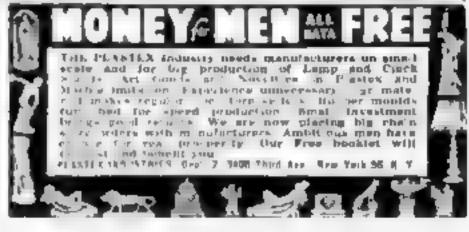
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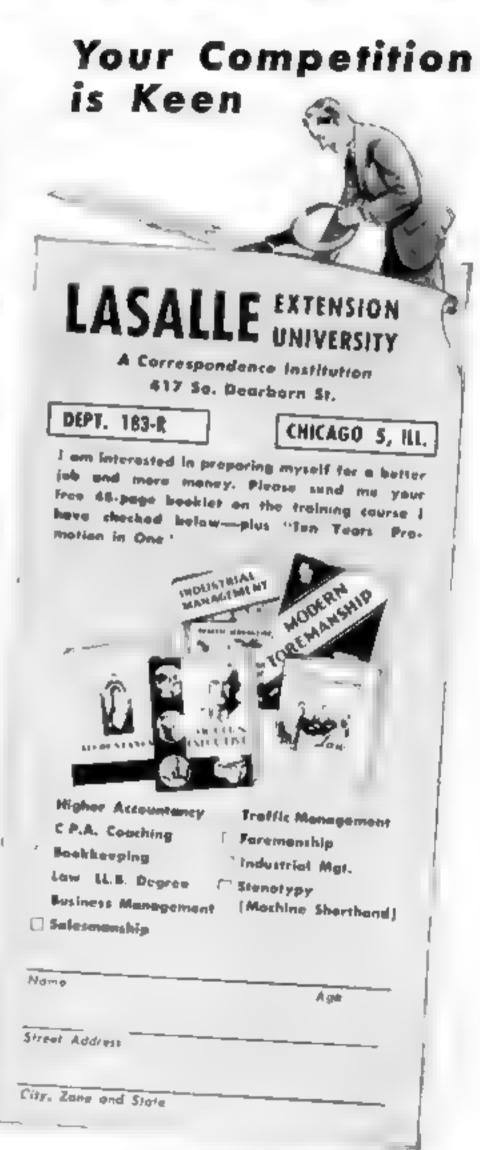
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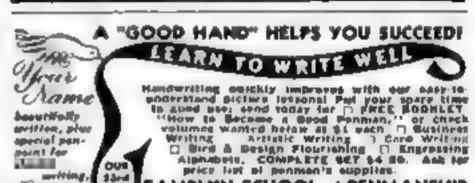
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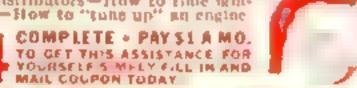
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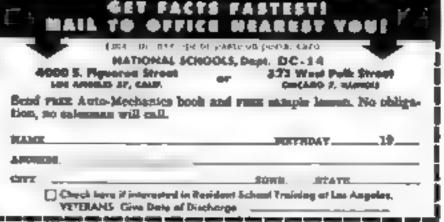
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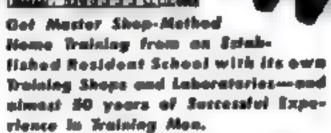


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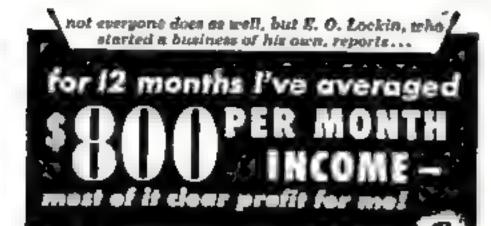
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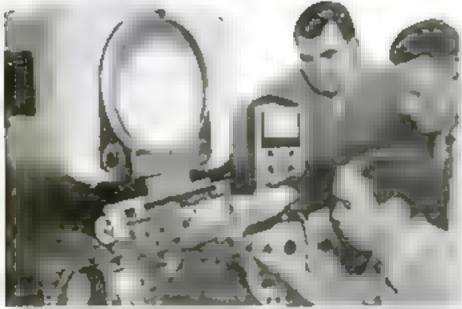
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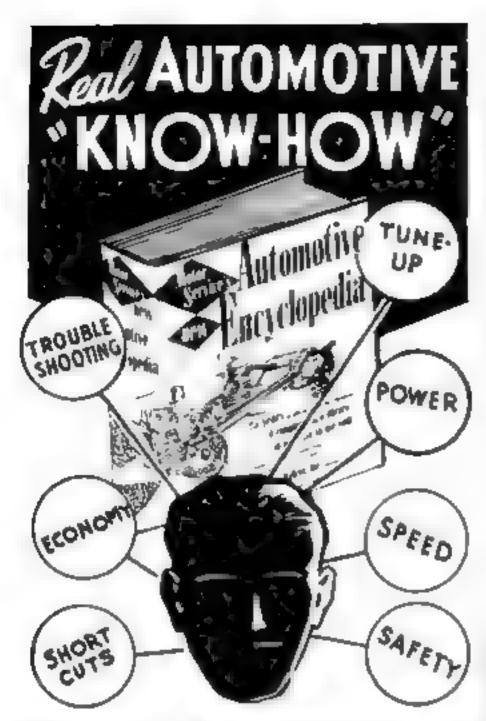
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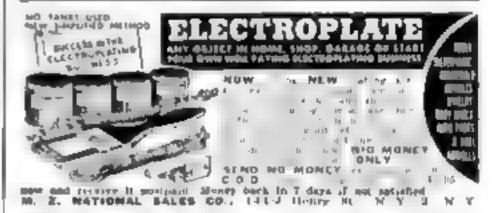
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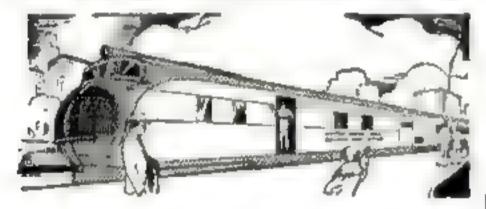
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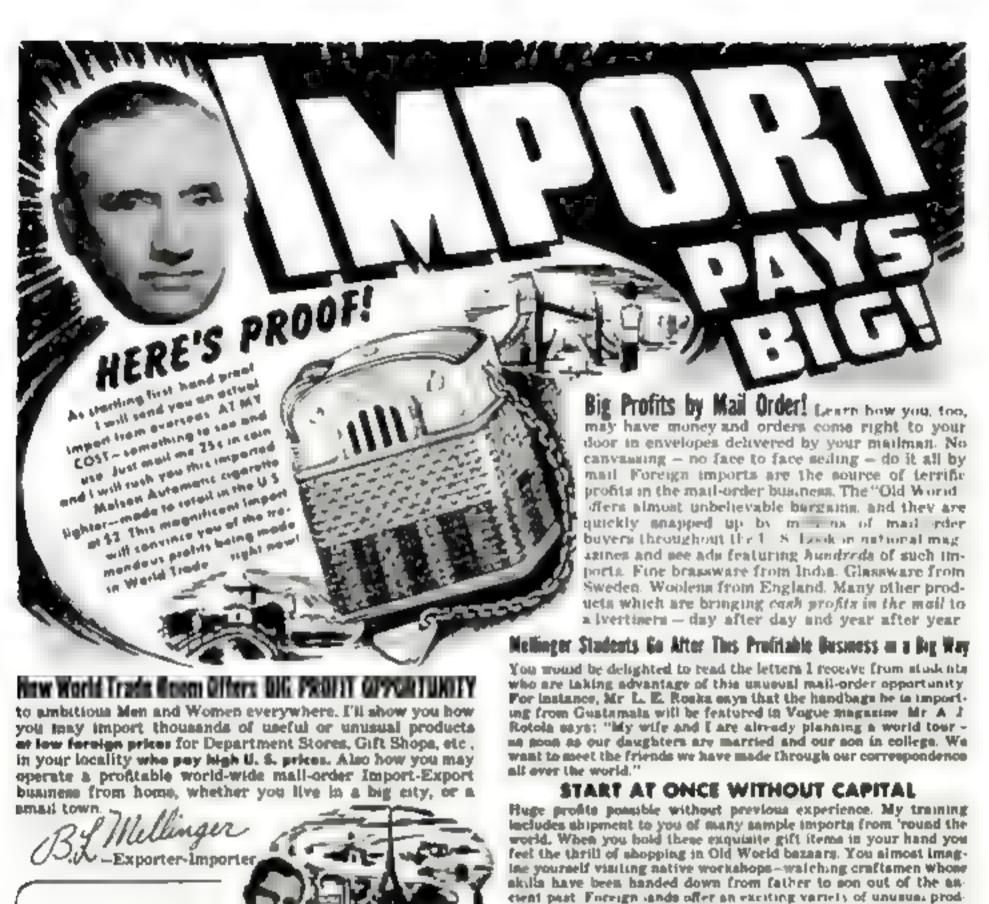
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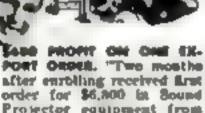
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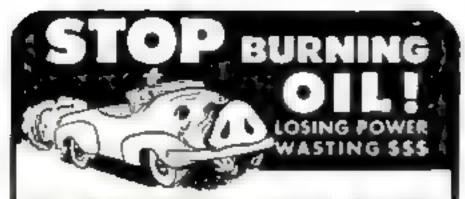
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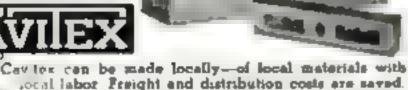
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# Start on a SHOESTRING!

The real-life storing of operage in Mail Order read to feary alea. If I had not personally known them people their stories would be hard to indexes. Yet they are not only true but they expresent just a few of the hundreds of "hitle operators" who have been suept into his money by Mail Urder.

BANCE. I personally guided his start when he invested an eutomatic peace, presser He started with one little and in one magazine. Four peace letter he retired — with analysh read artists in heap him in each incente the read of the life.

VAM MARK I worked with him for the pears. I not him when his was a wayon man for a tod and roffee house, knock-ling on doors. He want left Mari Circler on melting—marks manay from the part or sented up als years letter with an engage of \$50,000 and on income of \$1000.00 at years for the work.

DUGGAN. A few years ago he was a track driver. Started tooling with stall Order in a spare room in his spare time. Lost year he said, "I don't know how much I'm worth-watter you got the first million you got heaping track."

Jailly Jack Dec. Searted in wealt Made Order business of herea—just on hump excepted it technic good and the came to me for advers I showed her how to accord to two years the business ger on higher business ranging his jub to help manuse it.

FORMAN. Farmen worked as a back to \$20 a week. He had refe then he had not been as an additional terms of affecting tenerating he didn't have made as many orders he had to find a source of supply. He made \$18,000 the first paint. He gives me tradit for "physical the way."

JORGENSON, Consulted me shoul approbably product On my advice he real two od to "fast" by satestably. That get brought eates of \$50,000 to his first year he did at justices of agenty a half patting dollars. He treplead investment was less there at theseast.

These things I have seen. These prople I have briped to the realization of their decemps — three and hundreds of others. My own fortune and made in Mad Order And new my secrets can be yours.

Have you ever thought of running a profitable little adding right from your home? Has it occurred to you that you are just as capable as anyone else of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it's run (on tiny investments) by innumerable small operators?

Forget shout Sears and Ward's! Read glout the "tittle fellows" ...clerks, teachers, veta, mechanics, salesmen and others ... who are packing Mail Order items in bedrooms, apare rooms, attice, garages, cellars ... dumping them in the Post Office ... and quietly banking the fatful of Money Orders, each and checks delivered to them daily by the mailman.

An annual business of almost a billion dolfors as done by 'little fellows' who advertue and sell just one tient. The Department of Commerce of the United States says, "A number of the most successful obtain tacomes as high as \$40,000 to \$50,000.00."

It's an incredible story . a story of a business that a wide-open for newcomers . . with opportunities for income far-and-away greater than you can ordinarily hope to attain by holding down a job. And in Mail Order you can stay as small as you wish run your deal as a \$50 or \$75 weekly sideline—or consider jacking it up into really big figures as a full time operation.

Glance at the examples at left. These true stories are for from unusual. Multiply them by the hundreds and you begin to get an idea of what can be done. . what is being done. in the phenomenal Mail Order field.

Yet, if you were to jump blindly into Mail Order your chances would be alm. A peculiar brand of "know-how" is vital in thus little - known, little - understood business. This is fortunate for you If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloaded years ago.

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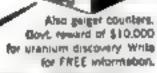
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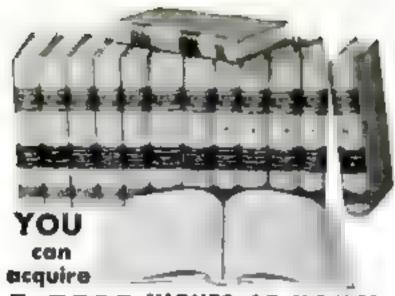
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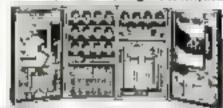


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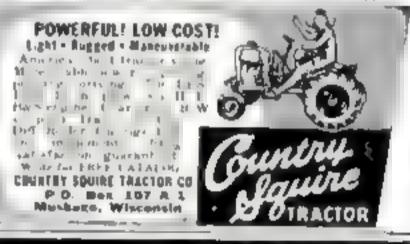


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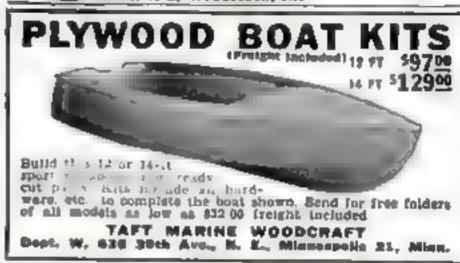
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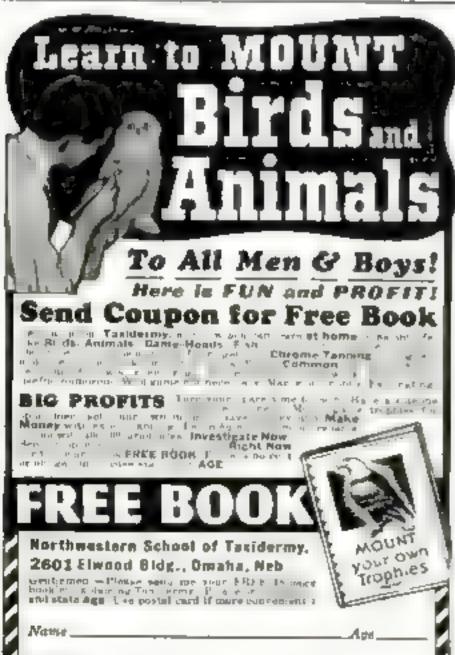


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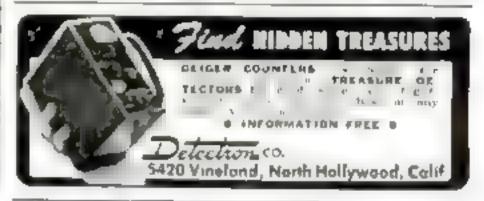
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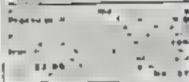


















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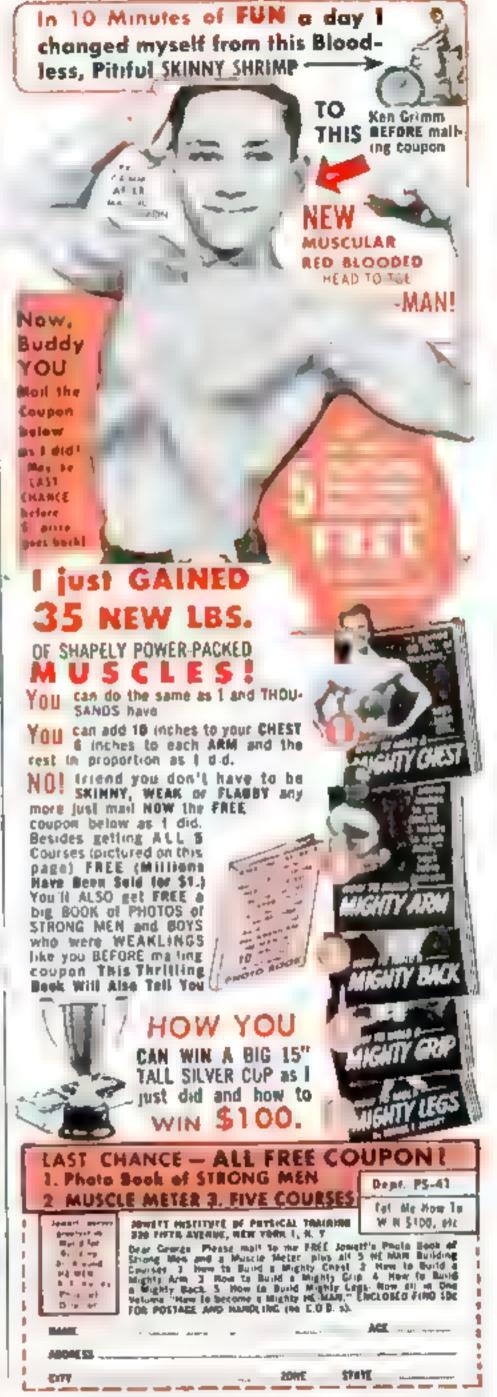
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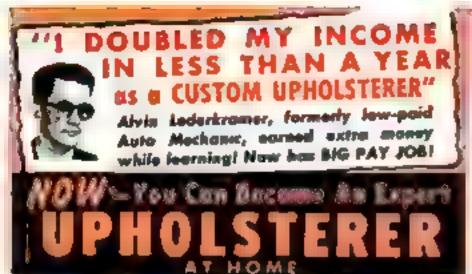
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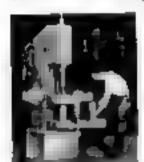
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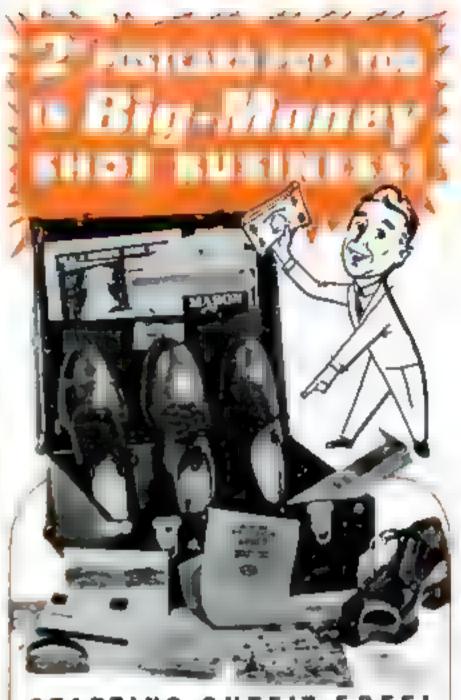
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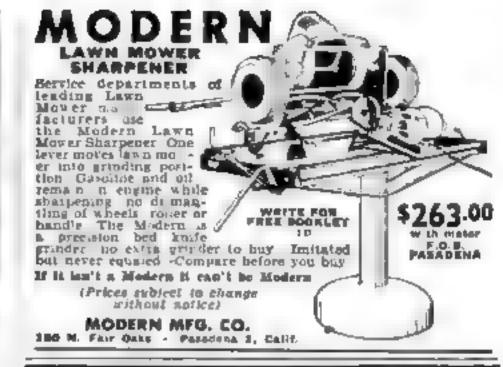
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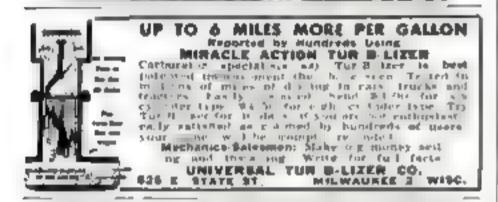
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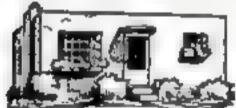
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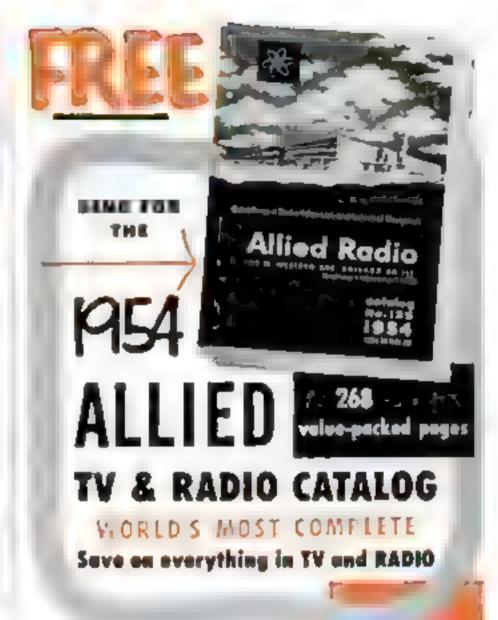
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You might expect all this to require a complicated mechanical gadget, but when you see it, the most curprising thing will be that I've done all this in a pipe that looks like any of the finest conventional pipes.

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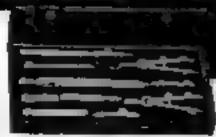
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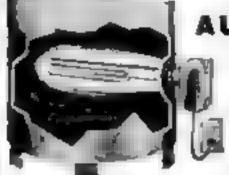
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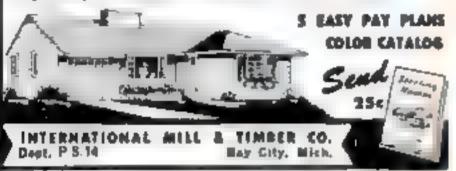
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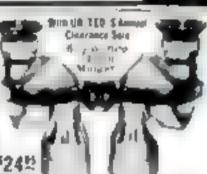
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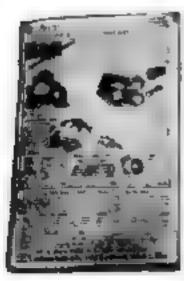
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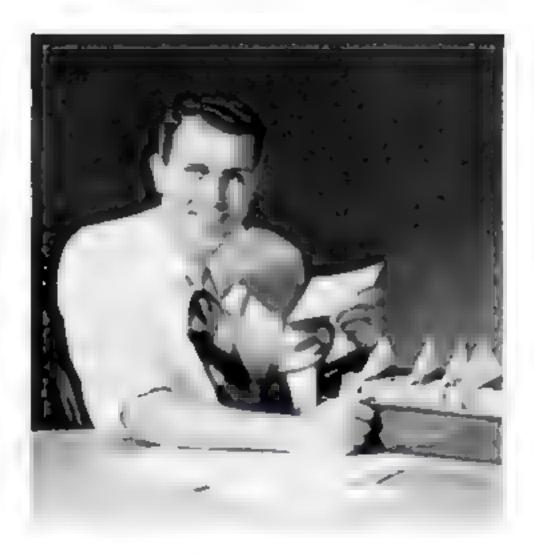
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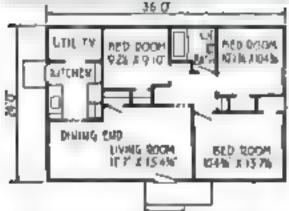
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Since 1934, the U.S. has put \$51,000,000 into building a highway to Panama. It's now 56% paved and 36% more is passable—but 8% is still impossible!



ONLY three humps of mountain and jungle stand between you and the most picturesque auto trip in North America. They are nightmarish miles, but they add up to only 220 out of 3,250 miles of spectacular beauty and infinite variety. If it weren't for the humps, you could take the trip right now.

JANUARY 1954 97



Please turn the page for highway photos.



After a soaring start, it lands in a ditch

Mexico (above) has proudly built 1,600 miles of the Inter-American Highway without U. S. help. But the road quickly becomes impassable when it reaches Gustemala (below).





Beyond a majestic span, there's no bridge at all After smoothly crossing most of Guatemala and all of El Salvador (above), Honduras and Mearagua, the road again bogs down (below) and cuns out where it enters Costa Rica.





After a leap above clouds, it peters out in the bush

In central Costa Rica (above), the road provides magnificent views. But suddenly it plunges into wild country (below) and ends, 130 rugged nules short of the Panama line,





All photos from U. S. Buresu of Public Reads

#### Beyond a snart of jungle lies an alluring goat

for 20 years has been inching its way down the long curve of continent between the U. S. and Panama.

It's a road that slices a cross section of the ages. It provides glimpses of the remains of ancient civilizations and occasionally of people whose ways remain as primitive as those of the Indians who peered from dark forests at the debarking Pilgrims.

It's a road that crosses noble mountain ranges, leads through one of the most modern-looking cities in the world, divides fragrant groves of orange trees, dips towards the sea down vivid slopes of red and green rocks, winds past smoking volcanoes, skirts lakes of incredible blue, and plantations of cotton, coffee, bananas.

At the end of this alluring international highway lies the Panama Canal, a road for those who "plow the paths of the seas."

You have invested \$51,000,000 during these last 20 years to push that highway to the edge of the Canal. The people of Mexico, Guatemala, El Salvador, HonduUnder a canopy of royal paims, the road enters Panama City, 3,250 miles from Laredo, Tex. But three formidable gaps still block your path to this charming destination.

ras, Nicaragua, Costa Rica and Panama have invested millions more.

Fifty-six percent of the 3,250-mile road is paved. Thirty-six percent more is comfortably passable. But eight percent is impossible!

After all this time and money, there are still three gaps in the highway, thwarting the hopes of eight nations and damming the flood of automobile tourists who are waiting to enjoy and help enrich the lands along the way.

#### Road Would Attract Thousands from U.S.

Even people who have no desire to see those exotic countries between here and Panama must appreciate that if the route through them were clear, it would divert thousands of cars' that now crowd the roads leading to the scenic beauties of the U.S.

The gaps in the Inter-American Highway would not be so serious if they seemed to be temporary.

One of them, fortunately, won't be in your way for long. A 50-mile length of road still remains to be built in northern

## Famed Highway Planner Backs Road to Panama



For a number of years I have been extremely interested in the Pan-American Highway and have urged that it be progressed at an accelerated rate. The Federal Government should take a livelier interest in this project—that is, in finishing the main Central American route without further delay.—Robert Moses

New York Cits Construction Constinctor and Liberryon, Tribucough Bridge and Tannel Authority

Costa Rica to book up with Nicaragua's completed portion of the international highway. But U. S.-Costa Rica funds are available for the job, road crews are hard at work, and the gap is expected to be closed by the end of 1954 or early in 1955.

It won't do you much good, however, as long as you can't drive from Mexico into Guatemala or from Costa Rica into Panama.

Right now, those two gaps are beginning to look as permanent as Gibraltar.

The first one is a 25-mile stretch in northern Guatemala. The proposed route through here follows the windings of the precipitous Selegua Canyon. The canyon is deep, but the marsh of international politics into which hopes for the road have sunk at this point is far deeper. Until the political bog is drained, the only way to ride through the Selegua Canyon will continue to be by bicycle or mule.

The only way to get by automobile from the Mexican end of the 25-mile gap to the Guatemalan end is to take a 500-mile detour, including half a day's ride on a Mexican freight car!

The second apparently unbridgeable gap on the highway route to Panama is a much broader one. It is a 130-mile road barrier of formidable dimensions, in southern Costa Rica.

At the edge of the gap, the Continental Divide squeezes against the Pacific shore, and the route crosses it at 10,932 feet above sea level. On a clear day, you can see both oceans from the pass, though each is more than 100 miles away.

[Continued on page 256]

#### International Business Leader Says Panama Road Would Be Great Boon



The Inter-American Highway is one of the great unfinished jobs of the New World. It should be pushed forward to completion at an early date, especially because only three small gaps remain.

As I view projects of this character, they are of tremendous value in promoting understanding between peoples. After all, there is no substitute for travel as a medium of broadening our knowledge of other peoples. When nations have as much in

common as do the people of the two Americus, it is tragic that they should not be able to get better acquainted than they are.

No medium that I know of lends itself better to such associations than does the road. Over it, the traveler can move at will, stopping as he wishes. He can chat with others, observe their way of living, even perhaps become a resident or an investor.

The road does much more, as we in the United States have good reason to know Through its improvement, the farmer finds his market place while his family is able to share all the benefits of community life.

New areas of productivity, so many and so diverse in the Latin countries, can be opened to commerce, and out of that the whole way of living is lifted. New and solid values are created. Mexico is a pointed example.

From the standpoint of those of us who live in this country, the road will give us new opportunities for trade as well as for tourism, but the first gain is to those in whose countries the road is found.

As a means of building relations between people with a common desire for freedom, I see the Inter-American road as a great Highway of Friendship.

Its dedication to the services of the Americas should be set for an early date.

-PAUL G. HOFFMAN
Chairman of the Board of Stude
tooker Corp. and Inches head of
EC 4 and Ford Foundation.



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feet long, but its rear-placed wing has a span of only about 22 feet. During its Air Force test flights, the X-3 was packed with 1,200 pounds of research instruments to record information for use in designing future faster combat planes.



# **They Test Cooking**

Using a small bottle that acts almost human, Government chemists save time, money and animals in finding out the health value of what you eat.

#### By Herbert Yahraes

AT BELTSVILLE, MD., just off Route 1, north of Washington, D.C. chemists are putting foods through a glass stomach to determine what's good for our own.

The glass stomach is only a bottle. But the chemists—working for the Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture—have learned to make it act like a real stomach in breaking down protein.

That is important because it leads to a quick procedure—using test bugs called lactobacilli—for determining the quality of protein. And this, in turn, is important because it leads to ways for conserving this foodstuff and for finding new sources. Protein is so basic to life that a Dutch chemist 115 years ago appropriately named it from the Greek word meaning "first," yet most of the world has too little of it.



WHAT HAPPENS TO RATS can happen to us if we get too few proteins. For 100 days these two were fed equal weights of food; the bottom one simply are meals poor in proteins.

Maybe you've thought protein was protein, except that in steak it tasted somewhat better than in beans. That's wrong. Beltsville scientists some years ago fed two groups of rats a diet that was exactly the same except that one group got its protein from peanuts and the other from lentils. After three months, the first rats were sleek and healthy; the others, scrawny and sick.

#### **Building Blocks Missing**

Why? Because the protein in lentils contains very little cystine and methionine—two of the 22 building blocks from which protein is made. These building blocks are called amino acids.

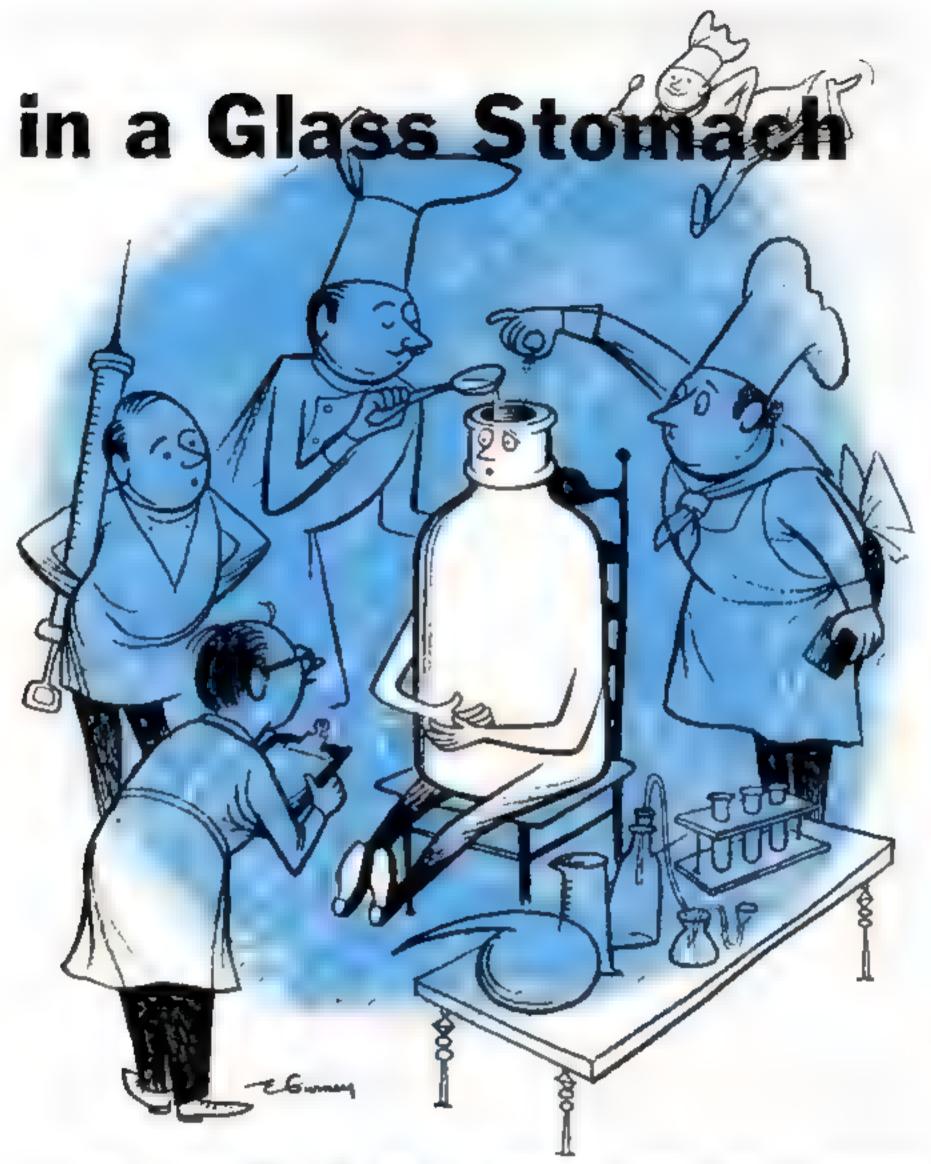
When you eat protein, your body breaks it down into the separate blocks and then uses these to make its own protein compounds—which vary widely, depending on whether they go into muscle, gamma globulin, an enzyme, or some other structure vital to your existence.

The body can manufacture a dozen or so of the building blocks itself, but it has to get the others by breaking down the proteins you eat. These others are known as the essential amino acids; if they aren't in your diet in sufficient quantity, something goes wrong.

#### Glass Stomach Speeds Analysis

That's where the glass stomach comes in, for it provides a quick method of determining a food's amino-acid content. It works like this:

The chemists, who are led by Dr. Millard J. Horn, grind about a spoonful of the food to be tested and drop it into a



four-ounce bottle. They add the two main digestive agents found in the human stomach. Then they take the bottle to the hot room. This is kept at body temperature—98.6 degrees—by thermostatically controlled electric heaters.

Here they clamp the bottle to a tumbling machine, a motor-driven cylinder fitted with a wooden sleeve holding 24 bottles, and this apparatus gently turns it over and over, end to end, in a process resembling the churning of the human stomach.

Next day the chemists add just enough sodium phosphate to alkalize the contents and thus match the conditions of partly digested food in the human being as it passes from the stomach into the intestine. Then they sprinkle in some trypsin, the main enzyme found in the



A BOTTLE'S DINNER—a spoonful of nourishing cottonseed meal in this case—is first ground fine and weighed. Test will tell how much of 10 essential anamogoids it contained.

intestine, and let the bottle tumble in the hot room for another 24 hours.

On the third day they add a dash of powdered hog mucosa, or intestinal lining. Like the lining of the human intestine, this contains a dozen or more enzymes. In another 24 hours of tumbling, the amino acids are as free from their linkages with one another and with other materials as they can be gotten in a natural digestive process.

#### Bugs Need Same Amino Acids as Man

The food as digested by the glass stomach is now ready for the test bugs. These are lactobacilli-micro-organisms that produce lactic acid. They are found in cheese, milk, silage and soil. Providentially, the lactobacilli require the same amino acids as man, and they have to have them in the free state; they can't break down proteins to get them.

The digested food sample is diluted with water to bring it to a standard volume, about a pint, so that samples taken from it can be precisely the same size as those from other glass stomachs. Then the samples are placed in test tubes along with the sugar, salts, and vitamins the factobacilli need. Finally, a hypodermic needle is used to drop in the organisms. Each test tube gets one drop, and each drop contains half a million organisms.

For three days an incubator keeps the tubes at about 95 degrees, which is the temperature the lactobacilli like best.

2 AT FEEDING TIME, start of the test, a bottle gets its ground food, plus a dash of pepsin and weak hydrochloric acid, and its mouth is that with a rubber-lined cap.

How well the organisms grow depends upon how well their needs for amino acids are met by the food from the glass stomach. If the needs are well met, the bacteria produce so much lactic acid that it makes the solution cloudy.

But the scientists don't depend on appearances. By a process called titration, they precisely measure the lactic acid.

Maybe the test sounds like a lot of work, and certainly months of thinking and of trial-and-error experiments were required to set it up and prove it. "But," Dr. Horn points out, "with the glass stomach we can determine the protein value of food in six days, and we can run 24 foods at a time. What we can now do in a week would take a year with animals." He might have added that washing bottles is simpler than cleaning rat cages.

#### First Test-Cottonseed Meal

The glass stomach's first job has been to digest cottonseed meal—dozens of samples of it. Cottonseed meal is a pretty good protein: not as good as soybean meal but much better than wheat flour.

Cottonseed meal is now widely used as feed, but the meal from one processing plant may be considerably more nutritious than from another.

The glass stomach told why. In extracting the oil, some plants cook the seeds at higher temperatures or for longer periods than other plants. Placed in the



3 DIGESTION OCCURS, in a room at body heat, when a tumbling machine gives test hottles a gentle churning like that of a real stomach. Then intestinal enzymes are added.

glass stomach, the meal from these factories released a smaller quantity of amino acids.

Along with continuing tests on cottonseed meals, Dr. Horn's group recently began putting other protein-containing foods through the glass stomach. The findings aren't complete, but here are two general ones your favorite cook might like to know about:

- You can't do much damage to animal proteins—meat, eggs, cheese—unless you actually burn them. A piece of roast beef well done is just as rich in the essential ammo acids as a slice of medium or rare.
- But you can hurt vegetable proteins. Cooking may cut their nutritive value by from 30 to 50 percent. The higher the temperature at which you cook a vegetable and the longer you cook it, the lower its protein value drops. These findings stem from tests on various kinds of peas and beans, and on corn, wheat, oats, rice and barley.

#### Explanation for Lowered Protein

Why does heat lower the protein value of hima beans, for example, and not of pork? Perhaps, the Beltsville group answers, because vegetables contain carbohydrates—sugar and starch—and in the heating process some of the amino acids become so entangled with these that the stomach, whether glass or animal, cannot free them for use.

[Continued on page 258]

4 AFTER A MEASURED DRINK of water, 72 hours beyond the test's start, digested material from bottles is poured into test tubes and given a dose of sugar, salts and vitamins.



5 500,000 SACTERIA—in a single drop from a hypodermic needle—next are put in each test tube. These bacteria—lactobacilli—happen to require the same amino acids as man.



6 IF BACTERIA ARE WELL FED, they produce 6 enough lactic acid to make the test tubes cloudy. The measure of the lactic acid is the measure of the meal's nutritive value.



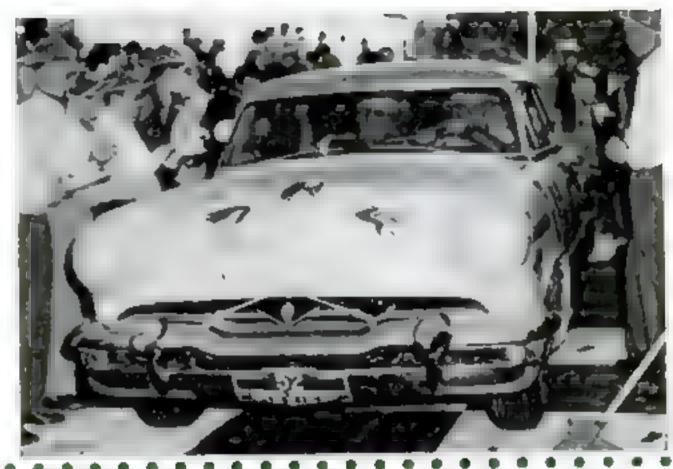
Six spectators crossing the road at a blind curve were killed when this Ford struck them.

# Death and Daring Win Mexico's Killer Race

Glory won by Lincoln, Lancia, Porsche and Chevrolet is dimmed by carnage.

THE bloodiest, fastest and quite possibly the last Pan-American road race ended with broken records and enough broken bodies to horrify all Mexico and the entire racing world.

If there is never another Pan-American road race, however, even the greediest SECOND-TIME WINNER in the big stock-car class, Lincoln repeated its impressive performance in last year's race. Four Lincolns flashed over the finish line at Juares in 1-2-3-4 order. Reporters here are gathered ground lead car, driven by Chuck Stevenson. who also led the field to victory in 1952. Lincoins in the race were 1953 models with 205-hp. engines and single four-barrel carburetors, which allowed engines to wind up to 4,600 г.р.т.



BARRELING ALONG in the high mountains between Puchla and Mexico City, Juan Manuel Fangio of Argenting whirls his winning Lancia around a tight curve. Lancias placed 1-2-3 in the big sports-car cluss, being trailed by a Ferrari, a Talbot, two more Ferrarie and a Jaguar. Fangio's total time for the 1.912-mile run was 18 hours, 11 minuten. He didn't win any single lap but his stendy pace brought him in alread of flashier performers.

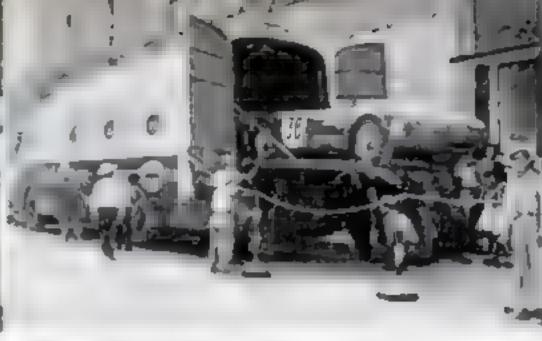


OUT IN FRONT of the light stock-car class, this Chevrolet, driven by 54-year-old C. D. Evans of El Paso, led two Fords, another Chevrolet and a Hudson across the finish line. Evans' total time was 24 hours, 48 minutes, but he claimed top speeds of 90-92 m.p.h. Evans had added only heavier shocks and an extra exhaust pipe. Casualties were heavy in the light sports-car class, in which a Porsche won. Twenty cars started; only two finished.





TEAMWORK PAID OFF for Lincoln. Four of the company's entries are here getting an engine check and a quick overhaul at Oaxaca, at the end of the 329.3-mile first lap of the race.



LUSH TREATMENT FOR LANCIAS included cartage to the start of the race in this enormous mobile garage, it contained a machine shop and dormitory and followed the racers.

fan can scarcely complain that the records set in this one could be bettered.

A Lincoln, at an average speed of 93.2 m.p.h., and a Lancia, at a dazzling average of 105.1 m.p.h. for the snaky, 1,912-mile course that runs from sea level to 10,000-foot summits and down again, copped first places and top purses in the big stock- and sports-car classes. A Chevrolet, at an average 77.1 m.p h., and a Porsche, at 80.1 m.p.h., tore off with the light stock- and sports-car honors.

Even though his Ferrari came in sixth among the big sports cars, Italy's Humberto Maglioli hurled it over the final lap of 222.5 miles at one of the most blistering average paces ever recorded in a road race—138.4 m.p.h.

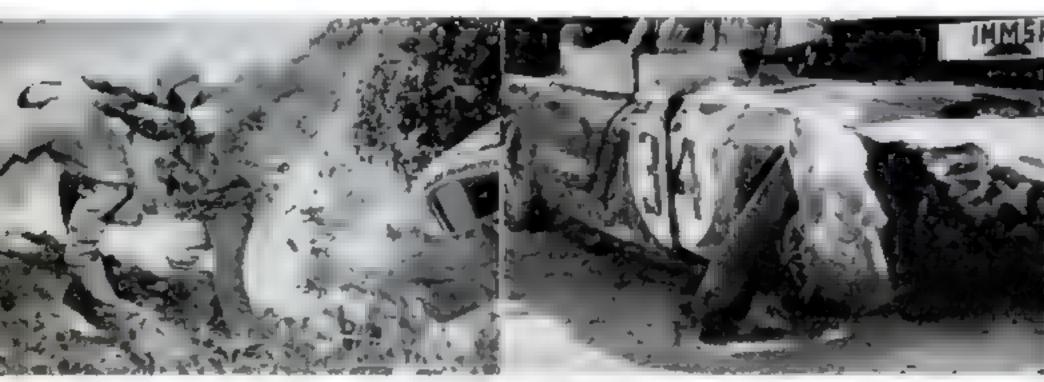
But "racing and sports cars can go just so fast, and Mexico's rugged mountain highways will allow just so much speed," said one apprehensive commentator, expressing the gloomy thoughts of many. "Beyond those limits, the Pan-American road race will simply become suicide."

Lethal enough already, the 1953 race took a shocking tell of nine lives. At least a dozen cars were wrecked and dozens more were driven to death. Only 66 out of the 177 cars of all classes that began the race managed to finish it.

One driver unconsciously predicted his doom to the Mexican nation, following every mile of the race by radio.

"I'm going to fight this race to the death," shouted famed Felice Bonetto of Italy into a mike at Mexico City

A few miles beyond, his flashing Lancia skidded into a concrete telephone pole and Bonetto's race ended as foretold. END



TWO LIVED TO DRIVE AGAIN, though their Oldsmobile entry was thoroughly demolished. They flew off the road into a rayine near Oaxaca, but escaped with mere scratches.

ONE MET DEATH when this Lancia skidded into a telephone pole, Felice Bonetto, one of Italy's most famous drivers, was at wheel and winning the race when crash occurred.



#### High-Tailing Cameras Record Air Flow Over Bomber Wing

IT TOOK a lot of scaffolding to mount that pod lagh on the tail of the Stratofortiess those. But when the plane took off (right) a pair of movie cameras inside the podfilmed the in-flight action of hundreds of tiny nylon tufts glued to the left wing Booing aerodynamicists found the B-52 wing behaved just as early wind-tunnel tests with models showed it would

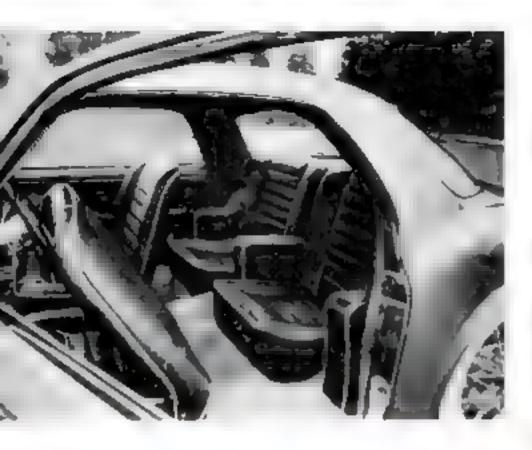


#### Pilot of French "Flying Funnel" Rides Way Out Front

A JETTISONABLE cockpit ahead of the air mark the latest version of the Leduc 021 a

French ramjet. It has straight wrigs with intake and retractable outrigger wheels fuel tanks at the tips and is designed for near-some speed in level flight





#### Dream De Soto Blends Sport Look with Comfort

AS A happy means of road-testing some new theories of design and attracting a lot of envious attention at the same time. De Soto has produced a dream car called the Adventurer (right). The company has no thought, however, of producing it in quantity

Less than 53 inches high, 185 inches long over-all, and with full cutout fender openings, the Adventurer is intended to remind you of Continental sports cars. But it seats four passengers in well-padded comfort (left), which no true

sports car does.

The Adventurer provides lots of glass area front and rear and rolls on unusually large wire wheels (16-inch diam-

eters) with knock-off hubs.

Powered by De Soto's 170-hp, V-8 engine, the dream car has a dual-exhaust system—the polished exhaust lines running along the outside of the body, just below the door sills.

# The transfer of the same of th

#### Dodge Dabbles in Daring Design Close to Ground



112 POPULAR SCIENCE

ANOTHER field day for designers and publicity men was enjoyed when Dodge produced its natty, single-coekpit Firearrow (right). Here, again, is a car that its maker has no intention of turning out for the public.

The Firearrow, 34 inches high at the doors and more than twice as wide as it is high, has a wheelbase 115 inches long. Its broad, sloping rear deck has two hatches, one for luggage and one

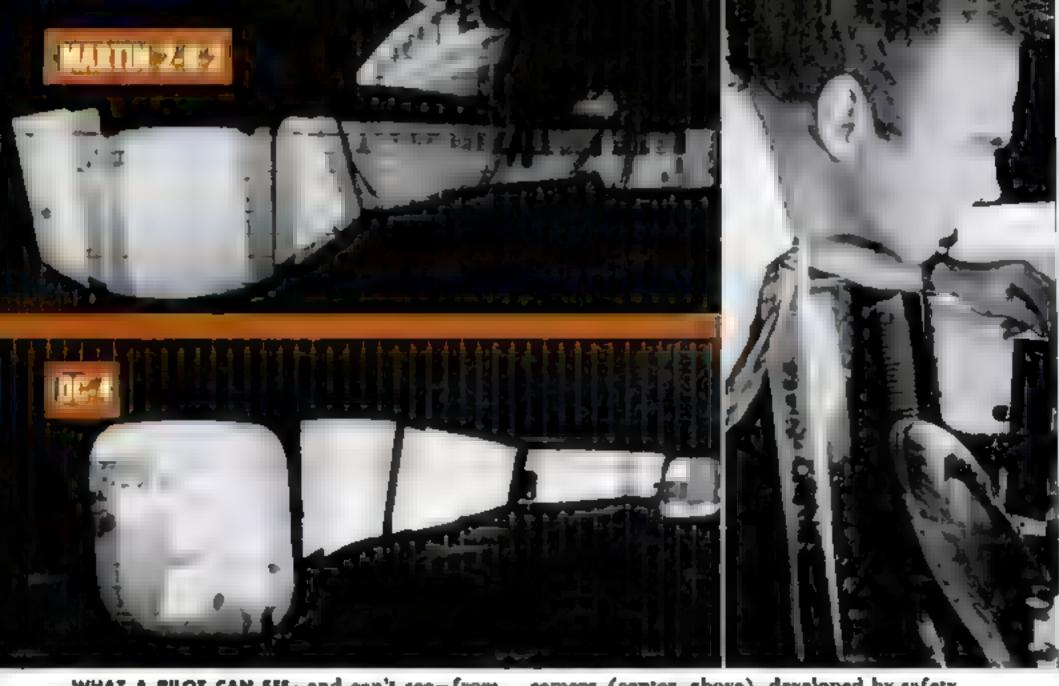
for the spare tire.

Door handles were omitted. About the only ornamentation is a body-circling rub rail, painted grayish tan. The car itself is a deep metallic red, with maroon-piped yellow-buff leather upholstery.

The unusual instrument panel (left) features two big dials—tachometer and speedometer—with ammeter and fuel, oil-pressure and water-temperature gauges mounted in their centers.







WHAT A PILOT CAN SHE-and can't see-from his sent in various airliners is accurately measured and recorded by a special robot

camera (center, above), developed by safety experts of the Civil Aeronautics Administration. Mounted in the pilot's seat, the two-eyed

Can airline fliers clearly see where they're going?
U.S. probers seek answers as in-flight crashes rise.

# Scientists Tackle Pilots' Deadly Blind Spots

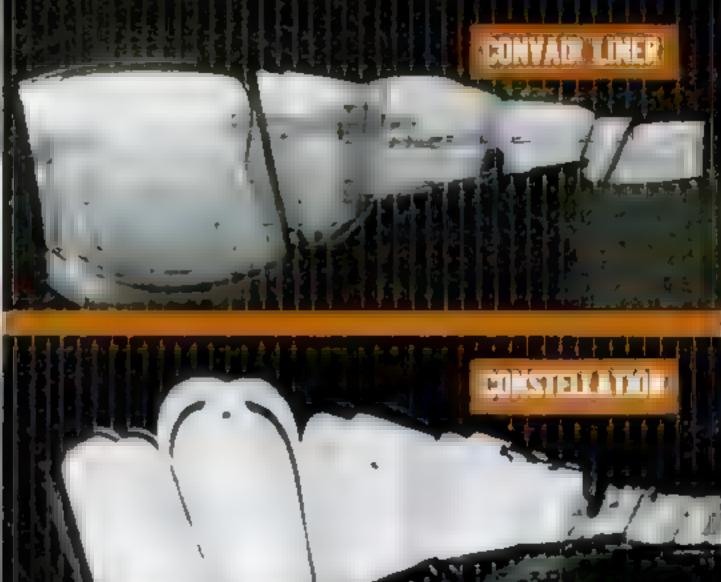
By George H. Waltz Jr.

JUST at dusk last August 26, one of the strangest airplane accidents in recent years occurred two miles over Michigan City, Ind.

Two regularly scheduled airliners—both big, sleek, modern twin-engine Convairs—flying in the same direction collided in mid-air. Fortunately, it was a "brush" collision. The propellers of each plane chewed into the fuselage of the other, but the damage wasn't great enough to prevent the pilots from easing their planes down to safe landings. Not one of the 57 passengers was even hurt.

What made the accident strange was the fact that the weather was good, both planes were flying straight and level, and neither was experiencing any mechanical troubles. The two planes had taken off from Chicago shortly before, a minute apart. The pilots had been





robot scans the windshield just as a pilot would do. It even leans forward, as a pilot would to increase his range of vision. The re-

corded results in four of the most popular types of commercial aircraft are shown in the panels at left and right above.

cleared to fly "visual flight rules," and both had decided to fly at 11,000 feet, where the winds were favorable. Visibility was good. Radio contact was normal. There seemed not a reason in the world why the planes shouldn't reach their destinations—Detroit and Cleveland—safely and on schedule.

Yet, cruising along in the twilight, they collided, one plane slipping across and under the other. And the strangest part of all is that, while several of the passengers in each plane later testified that they had seen the other plane and had wondered about the slowly narrowing distance between the two, neither the pilot nor the co-pilot of either plane had seen the other!

#### Too Frequent to Be Freakish

The accident could be classed as a freak—a once-in-a-million chance—except for one fact. In the U. S. in the last five years there have been 86 in-flight collisions, and in 82 of them the weather was good and the visibility was good.

Last August's accident, fortunately, triggered a chain reaction of controversies, discussions and inquiries revolving

around two questions:

• Does the pilot of a modern transport plane have good visibility—can he see what is around him when he is in flight?

• If not, what is being done about it?

The answers are many,

For the most part, the aircraft designers naturally feel that the visibility from the cockpit of a modern airliner is adequate and in line with the demands of streamlining and the needs for strength to withstand the air pressures of high-speed flight.

The airline people—pointing accusing fingers at the fact that 83 of those 86 in-flight collisions involved a private plane—feel strongly that the private fliers are at fault and that they should be restricted in their activities, or at least be made to fly under the same regulations as commercial planes. They argue that under present rules a private flier can just about take off from any spot



WINDSHIELD WAVINESS that can distort a pilot's vision is investigated by another CAA

camera. If glass is wavy, film record (above) shows two circles of light instead of one.

#### As airline people and private fliers blame each other

and head for anywhere without notifying anybody, that he can mosey in and out of congested airport areas at will, and that he can operate in and out of the airways without adequate communications facilities.

The country's 40,000 private pilots, on the other hand, counter by putting most of the blame on the airlines. Through their organization, the Aircraft Owners and Pilots Association, they say:

"It is alleged by airline proponents, both inside and outside the government, that near misses and collisions are caused almost entirely by private aircraft, in relatively bad weather, and under conditions beyond the control of the pilots involved. These allegations are simply an attempt to cover up the actual facts. These incidents, when they happen, invariably take place in good weather, are invariably the result of negligence or carelessness, and are invariably violations of regulations already in being.

"We cannot escape the fact that we have large numbers of large aircraft flying daily throughout the country at speeds from 200 to 350 miles an hour. And yet these very aircraft, operating in three-dimensional space, have less visibility available to the men flying them

than is available to the average motorist driving his car 50 miles an hour in two-dimensional space."

Most airline pilots, talking informally, admit that cockpit visibility could be better; but they hasten to add that even if it were better, they probably couldn't be any more on the alert than they are now because of the multitude of instruments they must watch and the paper work they must do between take-off and landing.

#### CAA Frets Over Cockpit Visibility

Officials of the Civil Aeronautics Board and of the Civil Aeronautics Administration, which enforces the flying safety rules the Board makes, are gravely concerned.

For some time now the CAA Technical Development and Evaluation Center at Indianapolis, Ind., has been conducting extensive studies in cockpit visibility. The work received added impetus a few years ago when a detailed questionnaire distributed to 6,000 regular airline pilots pinpointed one startling fact: Of all the pilots answering, one out of every four admitted that at some time in his commercial flying career he had been involved in, but by luck had



PILOT'S EYES ARE WATCHED by movie cameras that simultaneously record the view. If he

wasn't looking where he should have been at any moment, film (above) blabs on him-

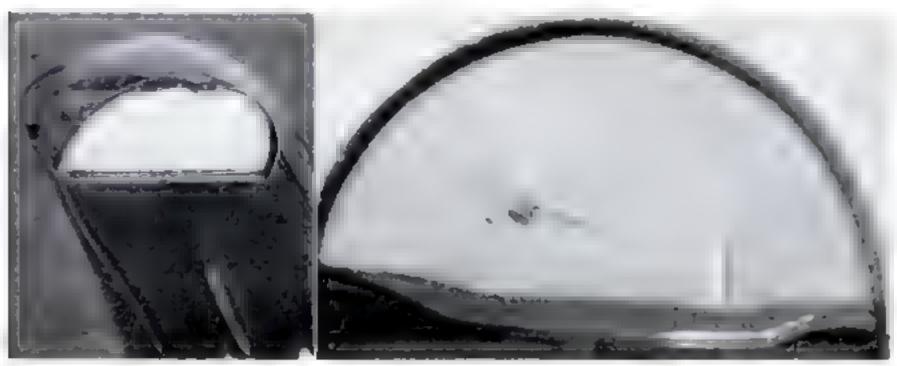
#### for collisions, ingenious cameras study safety hazards.

escaped from, a near collision caused, he felt, by poor cockpit visibility!

To measure the visibility from various types of cockpits accurately, CAA technicians have developed a special two-eyed panoramic camera. It is a robot camera that can be mounted in the pilot's seat with its twin lenses adjusted to normal eye level. Driven by an electric motor, the camera's eyes rotate automatically, just as a pilot's eyes would in scanning the cockpit's windows and windshield. The camera eyen leans forward at certain points, just as a pilot might do to extend his range of vision. When

the film is developed it provides a scaled picture of just what a pilot of that particular plane can see and can't see from his normal position at the controls. The films give an accurate, measurable basis for comparison in judging the relative visibility from the cockpits of all aircraft.

Another ingenious CAA photographic device makes a running record of exactly where a pilot looks when he is actually flying a specific aircraft. Mounted directly behind the pilot, the recorder—an arrangement of three motion-picture cameras—not only photographs



REAR-VIEW MIRRORS have been suggested as one way to improve cockpit visibility. At left

above is one installed in the roof of a small plane. At right is what the pilot might see.



ONE ANSWER to the problem is the larger windshield—21 percent higger than before

-of the new Super Constellation, Still, the pilot could see more in, say, a bomber.

the pilot's eyes through a series of mirrors but also simultaneously photographs the horizon out ahead as seen through the windshield of the airplane. By comparing the exposed films, frame by frame, it is possible to tell just where the pilot was looking at each instant during a flight.

In one recent test, five groups of airline pilots were checked as they flew

a Boeing Stratocruiser. Among the many findings outlined in a CAA report of that test, one fact stood out: "The results of the current study show that transport pilots attempt to search for other aircraft, but may be prevented from seeing them because of the windshield structure."

And yet, the Stratocruiser is considered by many pilots to have better cockpit visibility than any other transport plane.

At the CAB hearing following the recent Indiana collision, a good many

general suggestions were made as to what should be done to reduce the possibility—the coloring of aircraft to make them of in-flight crashes. They included the use of high-intensity flasher beacons on the tails of all commercial aircraft, the cutting in of additional cockpit windows in airliners, the installation of periscopes for side and rear vision, the use of airborne radar to detect mountains and storms as well as other aircraft, and the

painting of wide stripes of a vivid color, like orange-yellow, on the wings of all civil aircraft to make them stand out against gray skies and other similar silver-gray backgrounds.

#### New Ideas Tested, Some Used

Some of these suggested solutions to the problem are not only being tested but are being put into use.

> High-intensity flasher beacons are already being installed on the tails of the airplanes of two major airlines.

Several airlines are now carrying on extensive experiments with the latest types of airborne radar.

New plane designs include more windshield and window area in the cockpits. An example is the new, bigger windshield in the Super Constellation, which gives the pilot 21 percent more visibility than earlier models.

Both the Air Force and the Navy have been experimenting with stand out against backgrounds of land, sea and air. Following the lead, the manufacturers of light planes are also now using more chrome yellow and bright orange in the coloring of fuselages and wings. The tendency is definitely away from dull colors and shiny



JOKING SUGGESTION of private pilots is packet of cleaning tissue called "Anticol," for anti-col-

[Continued on page 260]



#### Look What Modern Art Did to the Old Jungle Gym

Nonopy will chase the boy off that modern sculpture—it's meant to be played on. One of a new series of recreation equipment, it is designed to put "esthetic beauty" into playgrounds, give city kids the fun of serambling over trees, rocks and caves. It is made of reinforced concrete by Creative Playthings, Inc., 5 University Place, NYC.



#### **Bananas Come in Plastic Bags**

Fitesh as when they were picked, bananas are now arriving from Central America in big bags of transparent plastic, which are slid over bunches of the fruit the way you'd put on socks. The new bags, introduced by United Fruit Co., retain moisture and prevent abrasion and friction burns.



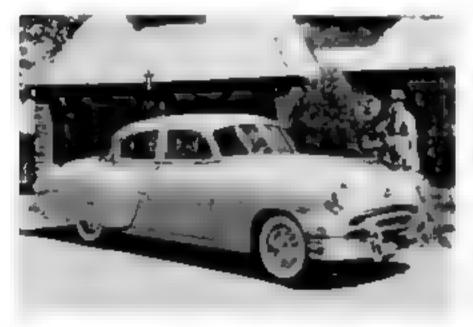
**Model Dog Delivers Lectures** 

VESTA (above) is a life-size Great Dane of plastic with Plexiglas skin, made in Germany to tour the U.S. One side reveals her internal organs, the other her bone structure. She's wired for sound and delivers a lecture about herself. As she discusses her innards, each part referred to lights up.

### Plush New Pontiac Is Longer and Stronger



LIFT the deck lid on the '54 Pontiac "Star Chief" and you find a luggage compartment 11 inches longer than on standard Pontiac models. The entire added length of



this newest line in the company's stable of cars has gone into the back end. Three stars on a modified "fishtail" identify it.

Four models are available in the linea hardtop (above), custom four-door, a fancied-up four-door (left) and a convertible. All have the Pontiac eight-cylinder engine, up from last year's 122 hp. to 127, and Hydra-Matic drives.

As an added attraction, the Star Chief line offers a series of colors not obtainable in other Pontiacs. If you'll look closely you'll find, in addition to the stars on the fenders, a chrome plaque at the rear windows. The wheelbase is 124 inches, two inches longer than that on the regular lines. This is to assure a better distribution of the weight imposed by the longer body.

#### **FACTS ON '54 PONTIAC**

Model: Star Chief hardtop.

Engine: 8-cyl, in-line L-head, 127 hp. at 3,800 rp.m., compression ratio, 7.7 l, piston displacement, 268.4 cm m.; piston travel (in feet per car mile at 30 m.p.h.), 1,481; bore and stroke, 3x" by 3x"; torque, 234 lb.-ft, at 2,200 r.p.m.

Weight: 3,500 lb. (approx.); per bp., 27.5 lb.

Transmission: Hydra-Matic; rear-axle ratio, 3.23:1.

Steering ratio: 25.1; radius of turning circle, 22%.

Effective brake lining area: 171 sq. in.

Springs: front, coil, rear, semi-elliptic.

Outside dimensions: height, 63.2"; overall length with bumpers and guards, 213.6"; width, 76.6"; wheelbase, 124"; overhang, front 34.5", rear 55.1"; tread, front 58.5", rear 59".

Inside dimensions: seat cushion width, front 59.8", rear 60.7"; leg room, front 42.8", rear 42.8"; headroom, front 36", rear 35.5", seat height, front 13.8", rear 12.5"; vertical distance, steering wheel to seat cushion with seat in mid-position, 5.2", front seat adjustment, horizontal 4.5", vertical 1.7".

Tire size: 7.10 by 15.



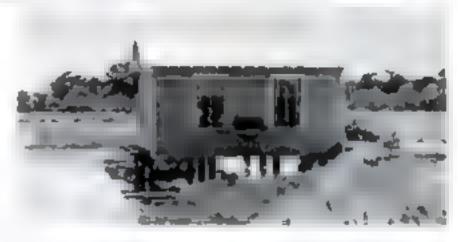
#### Fisherman Reels in Catch Without Leaving His Office Desk

PAT HIGGINS, owner of a 2,300-acre farm in Texas, does his fishing in solid comfort. Seated in his air-conditioned office built on stilts over an irrigation pond, he flips up a trap door and drops a line through the floor. Most of his ponds have been stocked and while the bluegills were growing to fishing size, the schools that gathered under the trap door were fed daily.



#### **Tractor Powers Road Roller**

Ride a tractor up the ramp on what the English call a Twose chassis and you have the motorized road-and-grounds roller above. A steering column dropped through the spokes of the tractor's steering wheel, and connected to the front roller by heavy chain, serves to guide the strange-looking vehicle.



▶▶▶A new fuel for kerosene lanterns is said to burn without any disagreeable odor while providing a clearer, brighter light. R. E. Dietz Co., Syracuse, N. Y. makes it.



#### British Get Heavier Heavy Tank

THE British War Ministry calls this tank "probably the most powerful in the world." The Caernarvon, it is claimed to have better armor and a more powerful engine than the Centurion which was used with great success by the Allies in Korea.

#### This Year You Can Buy

# 161 Chevrolets ...All Different



And here's the arithmetic on your varied choices:

CHEVVY ARRIVES at figure of 161 different-looking cars for 1954 by midtiplying colors available by models in each line or "series." In solid colors, for instance, 210 series has two models available in 10 colors plus one model in six colors and one model in three colors—total 29. Adding solid colors and two-tones gives grand total of 161.

# Want a distinctive-looking automobile? Now you can get it—right off a standard production line.

#### By Devon Francis

A MAN in Missouri wrote a letter the other day to the people who make Chevrolets with an idea that he thought was a daudy. Why not, he said, name one of the colors to be offered to the public in the 1954 crop of cars after a dear old lady, his maiden aunt? They could call it Agnes Pink.

As all big corporations do in such circumstances, Chevrolet replied gravely on starched stationery that the idea had profound ment but didn't quite fit in with its plans. Moreover—and here the company thanked its lucky stars for a

convenient escape hatch—it wouldn't be making any pink cars.

It's making them in just about every other color and hue, though. After the new Chevrolets were amounced last month, someone totted up the number of choices in models, colors, hues and two-tone combinations that the buyer could get on the salesroom floor. It came to 161.

For 1954, Chevrolet—which makes and sells more cars than anybody else on earth—is offering green cars, blue cars, beige cars, brown cars, gray cars, red cars, turquoise cars, cream cars, tan cars and some in-between hues. You can even





NEW HORN-RIM CAPS to match steering-wheel colors help spruce up interiors. Electric scat and window lifts are optional.



eyeanows on the tail lights are a '54 recognition feature. There's a new low-back-pressure muffler on all but convertibles.

FABRICS on seats and sidewalls and trim are richer. In Bel Air models cloths, combined with vinyls, are faced with nylon.



buy black cars. You can buy cars with ivory tons and turquoise bodies, beige tops and green bodies, and red tops with beige bodies.

You can buy a beige top with a red body and a silver wheel-stripe garnished with a maroon-and-beige trim. And when the man on the salesroom floor, showing all his teeth, gently tries to shoo you off an ivory-blue-silver-gray combination with an onyx-black treatment of the instrument panel, garnish moldings, lock buttons and steering-wheel rim and cap, on the plea that they don't make them that way, just say, "Better read your own sales literature, bub."

You can carry the differences a lot further than 161 Chevrolets for 1954. If you count in the number of variables possible in such factory-installed items as transmissions, brakes, steering and rear-axle ratios, the number of different cars gets to be astronomical. For a single model of a single line of Chevrolets this year—and there are 13 models in three lines in all—the figure is upward of 40,000.

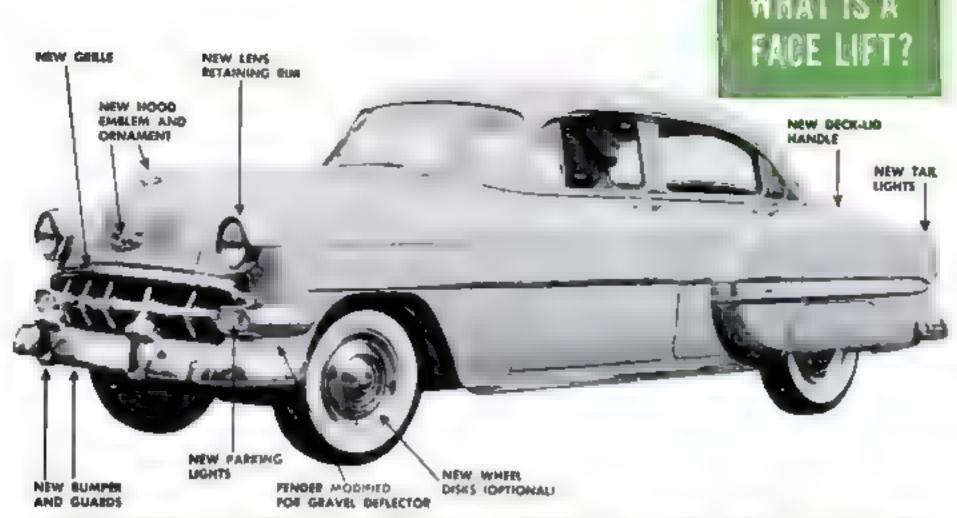
#### No Two Oshkoshers Would Have Same Car

That means that every man, woman and child in a city the size of Oshkosh, Wis., could each buy, say, a four-door sedan of Chevrolet's middle or 210 line, and no two of them would be exactly alike.

And this, bear in mind, does not count the multitude of possible variations with such dealer-installed accessories as radios, heaters, backup lights, seat covers and hare tails on the fender antenna.

The rash of colors in U. S. automobiles is relatively new. You could get colors long before World War II in fair variety, but the real profusion began only a couple of years ago. Gradually, color has come to share the emphasis put on the galloping horses in the new engines, automatic transmissions, power steering and air conditioning. The reason, of course, is that automobile owners want to be different.

Color variety in automobiles spawns
124 ropulat science



DETROIT LINGO for model changes made without replacing costly body dies, a "face lift" can add up to a big difference in looks. Not shown here is Chevy's mechanical news

for '54: the standard engine goes from 108 to 115 hp., Powerglide job from 115 to 125. A high-lift cast-from case does trick, helps performance in moddle, upper ranges.

endless stories in the cloakrooms of Detroit's factories. One of them is the Case of the Frightened Female, It seems that Chevvy turned out 7,700-odd ears last year of a special color, one for each of its dealers. The cars weren't offered for public sale. These cars were strictly show jobs. Some of the dealers, none-theless, disposed of the cars to customers. One fell into the hands of a matron who scared easily.

One day, out driving, she noticed a car following her. At its wheel was a man, Every time she turned, the man turned. She drove around the block. The man followed. Desperate, she pulled up beside a cop.

"That man's following me," she reported.

The cop stalked back to interview the suspected driver. He returned in a moment grinning. "The guy in that car," be reported, "says this here color car you got is a dealer's car. He's a Ford salesman and he's following you around to see where you stop so he can spot your sales prospects."

The most striking change in the public's taste in automobile colors is the growing popularity of the pastels—a light tan, for instance, in preference to a

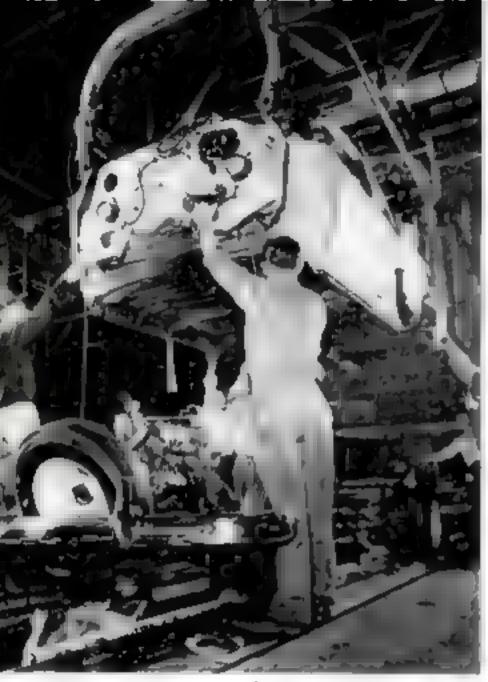
brown. Yet, with 22 colors and hues to choose from, car buyers—reports Du Pont, one of the suppliers of finishes to the industry—chose only five in bulk. They were light green (by far the most popular), light blue, dark green, light gray and black, in that order of preference, Clear down on the list were bluegreen, maroon, light red, light brown, medium red, medium gray, tan and dark red.

If you want a genuine oddity, buy a white car. Hardly anybody orders one. Better yet, buy a reddish mustard. Nobody wants that.

#### Bright Hues Go with Good Times

The Chevrolet people, wading around in oceans of statistics, report other quirks in the public's tastes. The evidence tends to indicate that in good times people buy snappy colors and in bad times the mood is for somber ones. Year to year, the northeastern states order the darker colors while Florida, the entire West Coast and the southwestern states like the lighter ones. In the Midwest it's 50-50.

Color in automobiles first began to tickle the buyer's fancy in the mid-Twenties—not long after Henry Ford, rid-



SODY DROP on production line dramatizes incredible scheduling job in making 161 combinations of body and color. Magically, the right wheels, body, chassis always meet.

ing a crest of popularity, fliply told a dealers' convention: "Gentlemen, you can have any color you want, so long as it's black." He lived to see his cars light up like pinball machines.

Color was becoming a definite factor in buyer preference by 1926. The new pyroxylin finishes, a guarantee against peeling, had been introduced. Manufacturers began leavening their traditional black with other colors. A decade later Edgar A. Guest, the newspaper poet, was writing:

When I was but a little lad
Few were the colors that we had
Then red was red and blue was blue,
And that was all we ever knew;
But since they have made the motor car
Behold how many shades there are!

That year, by the way, Eddie Guest himself was driving a two-tone Cadillac finished with what Du Pont, in an excess of eestasy, called Piccadilly Brown and London Smoke.

But far more black cars were sold than any other. Today black accounts for less than one-tenth of the entire market.

#### Gimmicks and Color Vie for Attention

Exactly 20 years ago Chevrolet made 11 models in two lines, in seven solid, darkish colors, including black.

As late as 1941 Chevrolet was offering a choice of pretty somber colors—13 of them—in all its models. Three more colors were available only in three specific models. One pastel turned up. Black predominated. But the two-tone idea had taken root. There were four of those in the catalogue.

Now the latest mechanical gimmicks have to compete with color for the buy-

[Continued on page 202]

#### **FACTS ON '54 CHEVROLET**

Model: 210 series four-door sedan.

Engine: 6-cyl. with overhead valves, 115 hp. at 3,700 r.p.m.; compression ratio, 7.5 l; piston displacement, 235.5 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,816.5, bore and stroke, 3.9/16" by 3.15/16"; crankshaft bearing surface, 29,37 sq. in., torque, 200 lb.-ft. at 2,000 r.p.m.

Performance weight: (curb weight plus 600 lb.) 3,960 lb., per hp., 34.43.

Transmission: Three-speed synchromesh (optional Powerglide torque converter with 125-hp, engine)

Steering ratio: 23.1 I manual, 22.1:1 power; radius of turning circle, 19

Effective brake-lining area: 158 sq. in. Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height, 635" at design load, over-all length with bumpers and guards, 196.44", width, 75", wheelbase, 115", overhang, front, 33", rear, 48.44", tread, front 56.70", rear 58.77".

Inside dimensions: scat-cushion width, front 59.9", rear 60.5", leg room, front 42.7", rear 41.4"; scat height, front 13.5", rear 12.6"; vertical distance, steering wheel to seat cushion with seat in mid-position, 4.4"; front-seat horizontal adjustment, 4.4".

Tire size: 6.70 by 15.



#### Just Two-by-Sixes Glued Together Make Roof for Big School

RESENBLING an airplane hangar, the arched shell above will become the auditorium for the \$1,250,000 junior high school at Lynnwood, Wash. The sweeping arches, which are the sole support for the roof, are

simply wood two-by-sixes cut to the proper are and glued together. Each arch consists of three of these laminated members, swing into place with a crane and then bolted. The architect is William Arild Johnson.

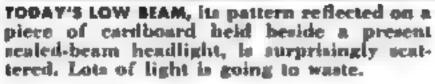


#### Not on the Wali, Junior—Do Your Drawing on the TV Set!

A NEW TV program for youngsters puts them right in the act. Winky Dink, a cartoon character, encourages them to draw on the TV screen! A kit sold to the budding artists contains a transparent film to fit

over the glass (above left), a box of crayons and a wiping cloth. As CBS's Jack Barry draws simple pictures on a transparent easel in the studio, the youngsters trace his lines (above right) at home.







TOMORROW'S LOW BEAM is concentrated where it will do most good. The cap on the filament creates a dark area where light now escapes to dazzie approaching drivers.

#### New Headlights Will Cut Down Glare

COMETIME this year, you'll be able to install brighter, better sealed-beam headlights than the ones now on your car. They'll spread more light across the entire highway.

And at the same time, in the low-beam position, they will sharply reduce the glare that now distracts approaching drivers, improve visibility in fog and storms and illuminate the curb and road shoulder better than your present lights do.

Wattage of the high-beam filament in the

new headlights, which are a joint achievement of leading manufacturers, has been stepped up from 45 to 50; that of the lowbeam filament from 35 to 40. Both filaments are capped, which accounts for the foglamp effect and reduced glare. Redesigned flutes in the lens concentrate low beams on the shoulder of the road.

As soon as the various states formally approve the new headlights, probably within 10 months, you will be able to substitute them for your present ones.

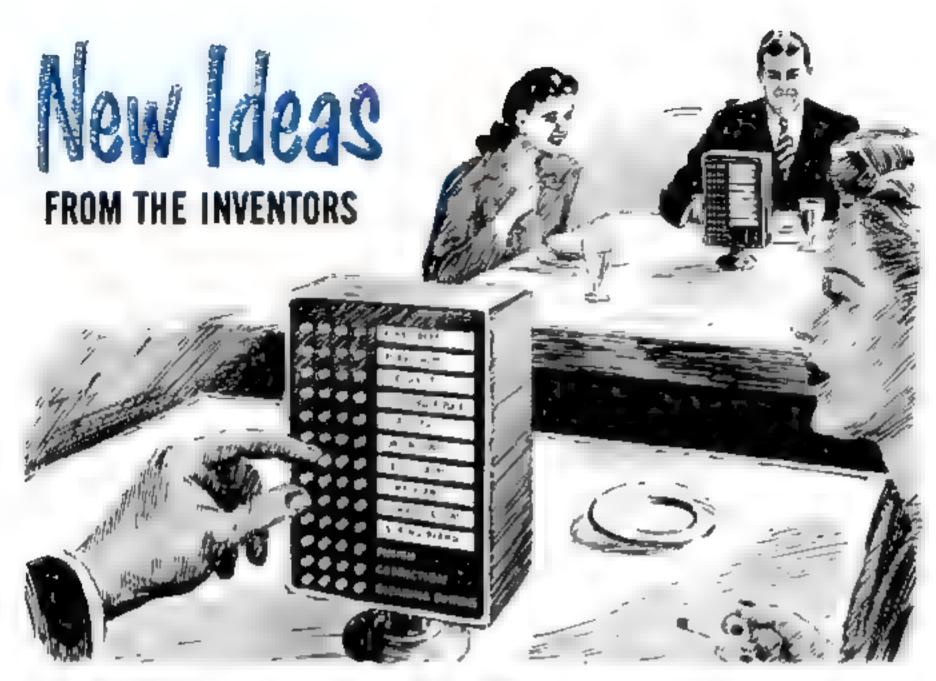
#### They Say Now ......

W. D. EVANS, ELGIN NATIONAL WATCH Co.: ". . . The father who urges his son to study watchmaking is giving him the best possible background to work successfully . . . in modern micro-instrumentation work."

CLAHENCE J. PFAFFENBERGER, VICE-PRESI-DENT. GUIDE DOGS FOR THE BLIND: "There is no reason why a puppy can't be quite happy in an apartment. Dogs like mental exercise better than physical exercise . . ."

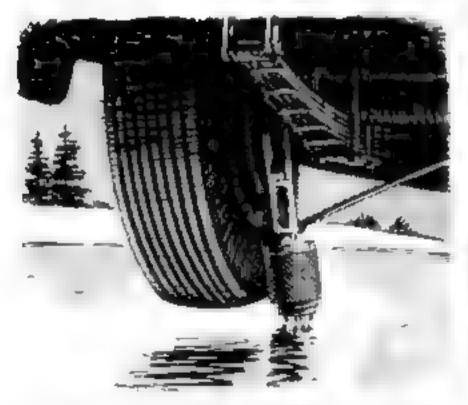
JOHN WILLIAMS STREETER, HISTORIAN OF SCIENCE, FRANKLIN INSTITUTE: "Today the ery is, 'All first-class mail by air,' a service now being tried by the Post Office on an experimental scale. In 25 years the guidedmissile interests will be well enough organized to be campaigning for: 'All firstclass mail by rocket."

DR. FIRMAN E. BEAR, RUTGERS UNIVER-SITY: "Soil consists mostly of substances that plants don't need and can't use."



1 Push Buttons to Order Dinner. Waiting for the waiter would become a thing of the past if restaurants adopted this electrically operated menu. A box mounted on or near each table would display the day's

bill of fare alongside rows of switches. By pushing buttons the customer would register his order and table number on a panel in the kitchen. The system is designed to speed service and reduce errors.

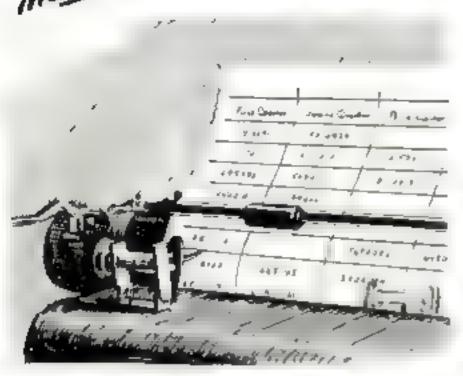


2 Creeper to Grip Icy Road. Rotating lugs on this traction booster would help start or stop a car on ice. Normally the device would be retracted, but when needed it would be lowered into contact with the road and rear tire. Even a skidding wheel would turn the cross-hatched cylinder and cause the ice-gripping lugs to move the car.



3 Specs to Cast Their Own Light. One person could read while another in the same room slept undisturbed if eyeglasses had built-in lights. These spectacle frames would support two small, adjustable-beam flashlights. A focusing arrangement would allow the user to pinpoint the rays or to diffuse them over a limited area.

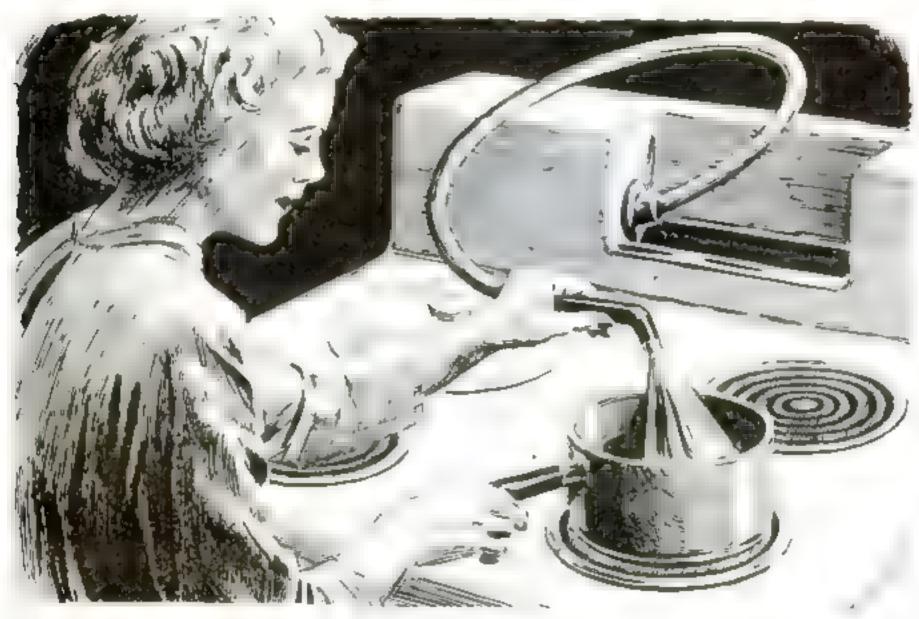
# MORE New Ideas from the Inventors



4 Guide to Rule Typed Sheets. People who have to type charts, graphs and the like might find this typewriter attachment helpful. A spring clip mounted on the frame would hold a ball-point pen that could be moved up against the roller. By shifting the carriage or rolling the platen the typist could rule straight horizontal or vertical lines.

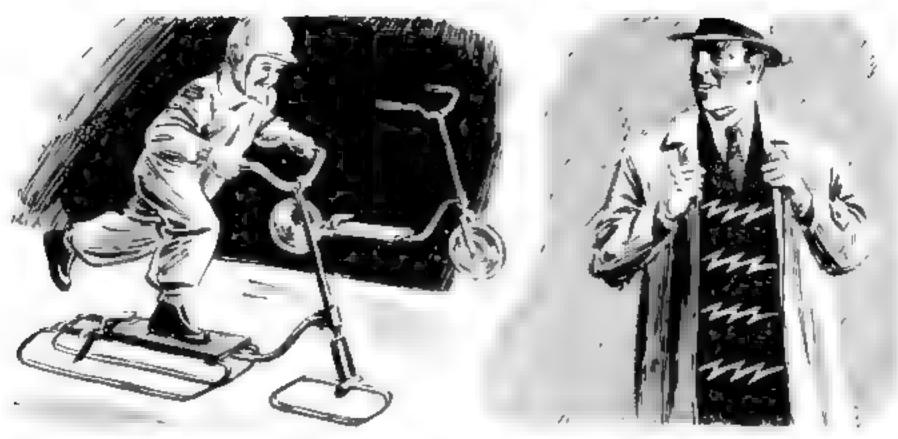


Alarm to Rouse Sleepy Driver. The ability to see out of the side of the eye, says this inventor, is the first thing a person loses when he starts to doze. To keep a driver alert, he would install a light on one side of the dash and time it to flash on periodically. If the driver failed to switch it off, he would be aroused by a horn.



6 Stove to Have Water Supply. A housewife would never have to lift pots off the stove to add water if her range had this handy faucet. A touch-control nozzle at the end of a flexible hose would reach to any

burner; springs would retract the hose into a space behind the splash panel. The hose would be connected to a supply of running water; the overflow could drain either into the kitchen plumbing or into a drip pan.



7 Scooter to Double as Sted. Interchangeable running gear would make this scooter an all-year plaything. The forks that hold the wheels and axies would serve also as retainers for a set of snow runners. The same pedal that braked the scooter by conventional wheel drag would be used to actuate a ground-drag spur on the sled.

Magnets to Zip Zipper. There are times when opening or closing a slide fastener is like threading a needle on the run. This zipper would open at a pull and you wouldn't have to align ends to reseal the interlocking plastic strips. Magnetized particles in the flexible plastic would be arranged to make strips attract each other.



Air Ducts to Clear Runway Snow.

One way of preventing ice from forming on airport runways is by blowing snow away as fast as it falls. This conduit beneath the center of the lane would aim blasts of compressed air over the road surface that would

push loose snow off to the margins. Air would be supplied by a central compressor aided, if necessary, by local boosters. The top or hood of the duct, which has to rise slightly above the surface, would be rubber, to yield under a plane's wheels.

U. S. patents on these inventions have been granted to: I. Mary Jones, Louisville, Ky.; L. Arthur Klein, Cincinnut; S. Thomas Brady, Henderson City, Ky., 4. Edward Mosher, Deapers S. John Markin, Pincknevville, Ili : 6. H. P. Zimmermann, Amstroille, N. Y., 7. John Caynot and George Gelfand, Scranton, Pa.; S. Robert Ellis, Branz, R. Y., 9. Amen Jordanny, Brooksille, N. Y.



TV camers is weighted enough to keep it from floating, not enough to let it hit bottom.

# Self-Propelled TV Camera Spies on Fish

It could also locate sunken treasure and hidden reefs, say Canadian scientists.

AT WHAT depth a female trout laid her eggs in Canada's Lake Minnewanka used to be her own business. Then one day recently a short, tubular metal monster with five shining eyes came swimming along and caught her at it-80 feet below the surface.

The monster, a self-propelled TV camera invented by W. F. Torrington, was spying for the Canadian Wildlife Service. Since that day it has pried into the affairs of many other fish, It has also inspected underwater installations in harbors.

The National Research Council, for whom the inventor works, believes the camera will be a big help in salvage operations, in locating sunken treasure and submerged reefs, and-operating from midget submarines-in charting antiinvasion traps along enemy coasts.

The camera is mounted in a waterproof container equipped with spotlights. Electric propellers move the container backward and forward and swivel it. Gasoline generators supply current for camera and propellers.

Focusing and lighting are controlled from a boat, to which the wandering camera is tethered by a leash of 500-foot cables.—Bill Bantey.

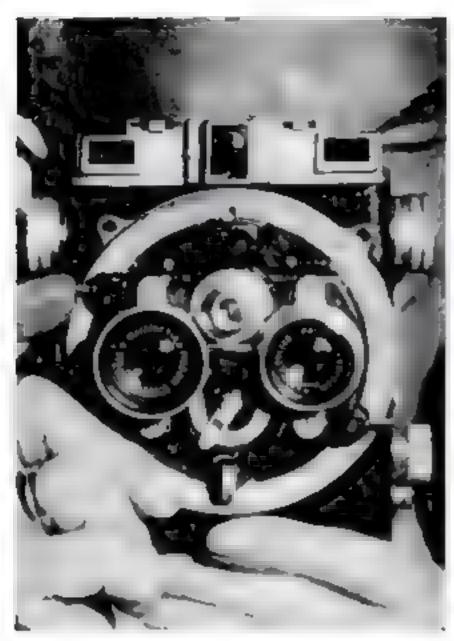


CAMERA IS LAUNCHED in Lake Monnewanka, near Bauff, from boat containing IV screens.

Cables are supported by occasional cedar floats to let the camera move about freely.

Bropping down for a book, the TV camera found most fish (below) simply loading around.

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#### Choose Your Color and Shoot

The fat German camera above has twin leases, film compartments and shutter releases. You can load it simultaneously with black-and-white and color film and be prepared for any kind of shot. It sells for approximately \$200.





#### Midget Sub Joins U. S. Navy

Giving orders by phone to an engineer below. Lieut. A. de Williencourt of the French Navy maneuvers into a San Diego dock one of two tiny submarines that France has lent to the 'U.S. Navy for observation and operational study.

#### Electronics Down on the Farm

ELECTRONICS engineers are following the plow in a Travelab (left) to design better farm machinery at lower cost. Electronic recorders and high-speed motion-picture cameras make stress-and-strain tests of equipment in the field. The Ford Tractor Division developed the motorized lab.

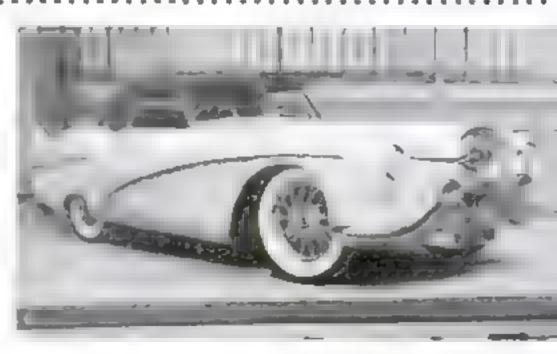
#### Latest Paris Styles—in Cars

A DESERT roadster, a plastic-body sports car made in Morocco and a super-slinky convertible marked the latest Paris auto show.

The big TAI Salmson at right has a lightmetal body and what looks like a huge eve on the radiator.

The desert car is the tiny VDB (center), which can climb steep dunes and cover 500 miles of sand on 17 gailons of gas.

Africa's contribution to the road-racing fratermity is the plastic REAC (far right). Its top lifts off for competition.



#### Powered Caravan Hitches No Rides

This German Volkswagen for campers travels under its own power. The driver sits over the front axle to leave plenty of space for housekeeping.

A couch running lengthwise in the rear opens to sleep two and a seat across the back can hold a child. Tucked just inside the open doors are a tiny sink and stove.





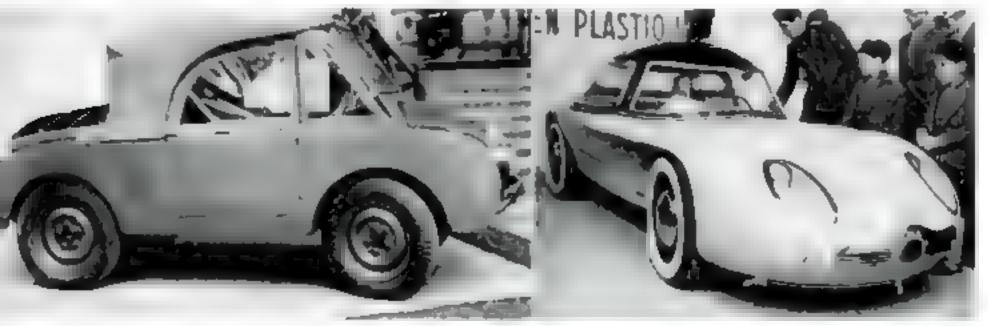
#### Mechanical Mule Joins Army

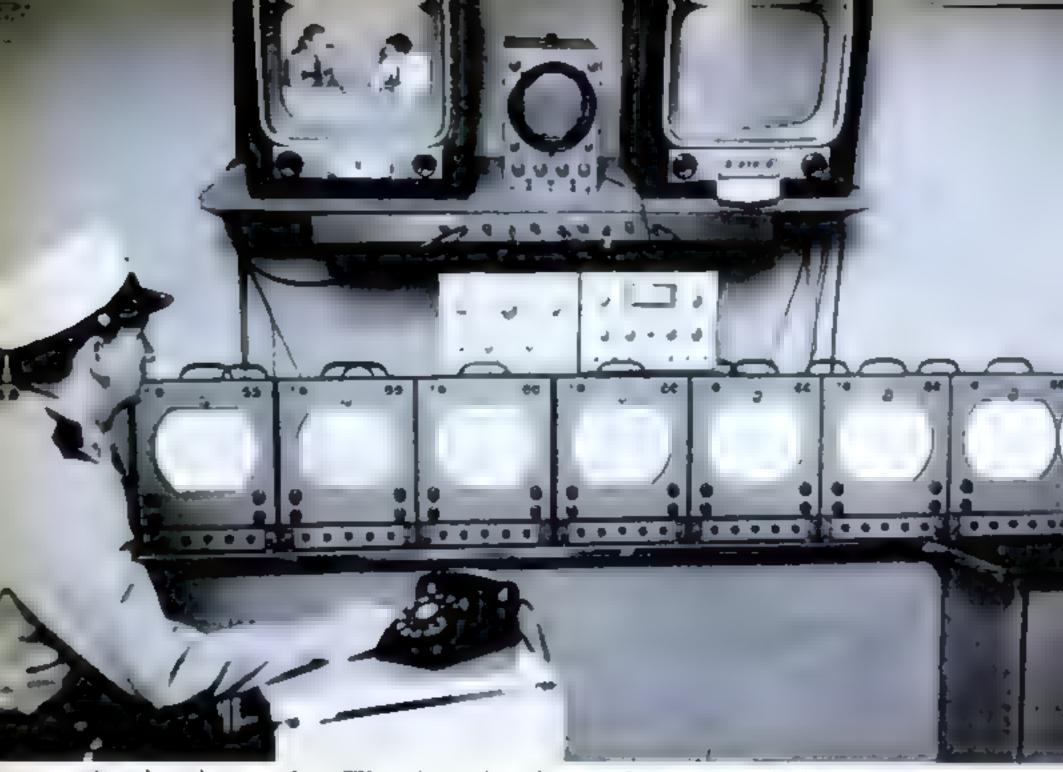
Just like a live mule, this new Army cargo carrier can be ridden or led. The controls are built low to the ground so that the driver can operate it while walking alongside. Four-wheel drive and four-wheel steering give it a mule's sure-footedness and maneuverability in rough terrain. It weighs only 740 pounds.



#### Plastic Cuts Trailer's Weight

Yessir, there's a girl inside the 24-foot trailer above. The see-through panels are made of glass-fiber reinforced plastic. The weatherproof, corrosion-proof trailer will increase payload for truckers without exceeding over-the-road weight limits. The Seaboard Transportation Co., Antioch, Calif., makes the bodies.





Guard watches one of two TV receivers, above batters of monitors, to check up on prisoners,

#### TV-Eyes Guard New Houston Jail

In Houston when a juder tells a personer that he's "going to keep an eve on lam the stact fooling. For Heuston's new multi-infliend dollar full tars \$45,000 worth of TV equipalent height camerus and eight receivers that helps police keep a 24 bour watch on their prisoners.

IV also I to the ballitual prisoners booked regularly display a little "Final One old repeater gives a song and dance routine every time has is in view.





GLASS-PROTECTED camera (in wall) is one of six snooping on prisoners' quarters. Others cover booking room and any cell needing special supervision. Here a guard talks with a reporter.

PORTABLE CAMERA can be located in corridor to let guards check on interviews being held behind those bars. Receivers—connected to cameras by wires—are located in key offices.

36 POPULAR SCIENCE



#### Underwater Bike Makes Swimmer a Human Submarine

A Navy frogman figured swimming under water with an oxygen tank on his back would be a lot easier if he came equipped with a propeller. That's when the Aquaped was born. The device is shown being demonstrated in a swimming pool at Las Vegas.



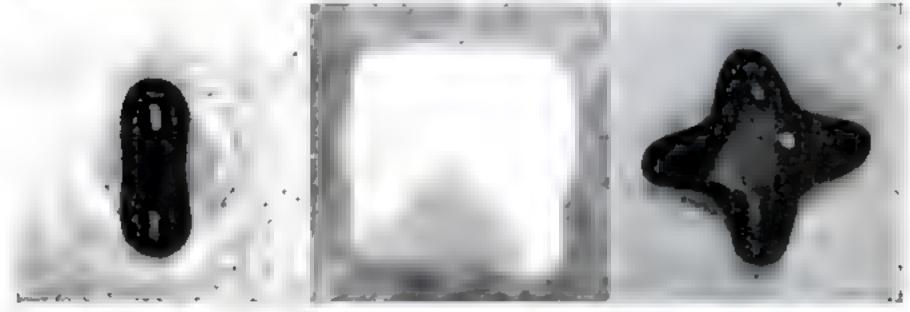
#### Flying Farmers Get Runway Kit

ANY meadow is an airport when a new landing-strip lighting unit is installed. You plow a furrow, drop in wire, drive stakes holding threshold and runway markers (left), and hook up cable. The Line Material Co., Milwaukee, makes the kit.



#### New Heel Slides On

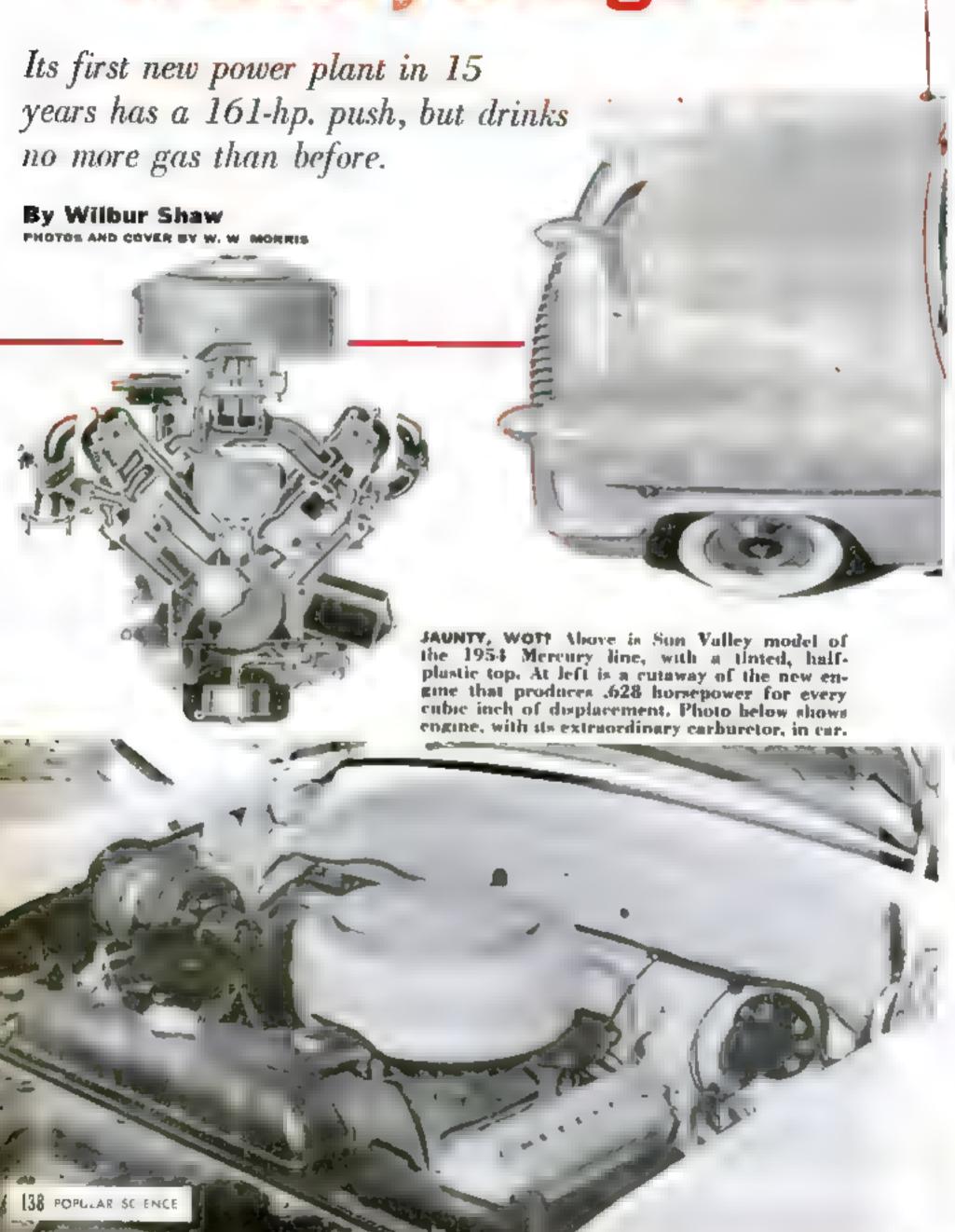
Time wasted getting his shoes re-heeled goaded an Englishman into this invention. A metal plate on the shoe allows replacement of a worn heel base with new layers of leather. You just slide in the retread.



#### Dancing Drops on a Hot Griddle Form Geometric Patterns

What happens when a drop of water falls on a hot stove? It never hits the hot surface but floats on its own vapor, vibrating and making patterns like those above. Viewed stroboscopically, drops appear as sausage shapes, triangles, squares, pentagons and other geometric figures. The Holter Research Foundation at Helena, Mont., noted the phenomenon and made the photographs while working on another project.

# Mercury Brings Out



# Valve-in-Head Engine



THREE years ago a Mercury engineer told me that the men in his department would never be satisfied until they designed an engine that are up a lot less of its own power than the ones then on the production line.

Well, they've done it.

I was introduced the other day to the newest member of the Ford Motor Company's family of engines. It's the overhead-valve Mercury power plant for 1954, with 161 horsepower.

This isn't an engine that will beat everything else away from a light. It wasn't built for that, it was built for expending less energy on its own friction and more on push at the rear wheels.

Mercury's first new engine in 15 years, replacing the old L-head V-8, is a "family" engine because it adheres strictly to tested Ford Motor Company design. Announced last month, it's conventional in appearance, with a short stroke and a

high-turbulence head. It contains no tricky curlicues.

But look what it does:

In the old engine, the sheer friction forces inside of it ate up almost a third of the power it produced. In the new engine, more than four-fifths of the power produced goes out the back end of the crankshaft to the transmission.

In the old engine, each piston shuttled back and forth in its cylinder for 21 miles for each 100 miles on the road. With the new one, the same amount of piston travel will drive the car 129 miles.

Piston travel causes wear. It also costs gasoline.

#### Engine Gets 36 More Horses

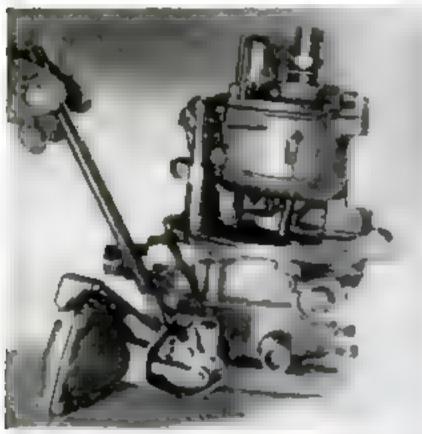
The old engine had 125 horsepower. The new one, at 161 hp., uses no more fuel than the power plant it replaces.

Don't underrate the acceleration performance, either. Last year's Mercury

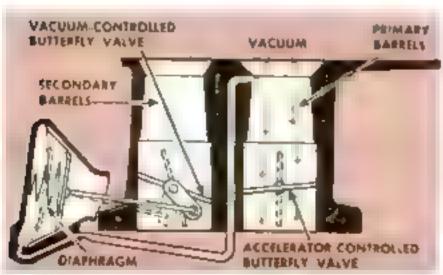


WITH THE POWER BRAKES—introduced in mid-1953—the pedal travel is reduced from 614

to 314 inches. With power steering, parking requires only seven to 10 pounds' rim-pull.



THE HEART of the new carburetor is this linkage to the auxiliary barrels, operated by the diaphragm to the left of the pencil. The float bowl sits on heat-insulating stilts.



THE ACCELERATOR PEDAL opens and closes only two of the carburetor's four butterfly valves. Vacuum controls the others. Sketch above shows how it's piped to the diaphragm.

took 52 seconds to reach 80 miles an hour. This year's car: 34 seconds, Perhaps more important to safety on the highway, this year's car is five car-lengths ahead of the old one at 80 miles an hour when the automatic transmission is "kicked down" at 50 m p.h. for passing.

More than the new engine has gone into the 1954 Mercury. A new carburetor is high on the list of improvements.

When I drove the car on the evergreen-screened Ford test track in Dearborn, Mich., and again on the Indianapolis Motor Speedway, I was struck by the smoothness of the power pickup as the accelerator went down. There was no transition point, no momentary flutter, no lurch as the car gained speed. The reason for it is the way the butterfly valves are opened in response to the demand for more torque at the rear wheels.

#### Engine Vacuum Opens Butterflies

In four-barrel carburetors (PSM, Mar. '52, p. 122), a means has to be provided for opening the secondary barrels when the engine needs more fuel. Some companies do it mechanically. Others do it with an air stream, induced by engine vacuum, that overcomes the pull of little counterweights on the butterflies.

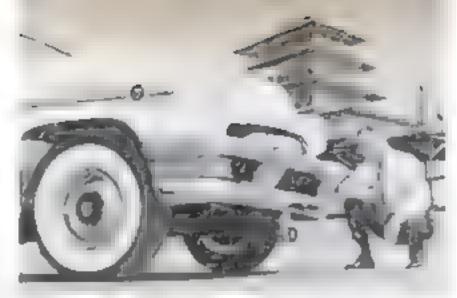
Mercury uses engine vacuum, too, but in a different way

As the butterflies on the two primary

barrels are opened by linkage from the accelerator, engine vacuum reaches up into the carburetor for more air. The vacuum relieves the air pressure on one side of a little spring-loaded diaphragm, auxiliary to the carburetor. In turn, this opens the butterflies on the two secondary barrels. When the vacuum drops, the butterflies close.

It's a neat way of tailoring the fuel supply precisely to the engine's needs—and it's a gas saver.

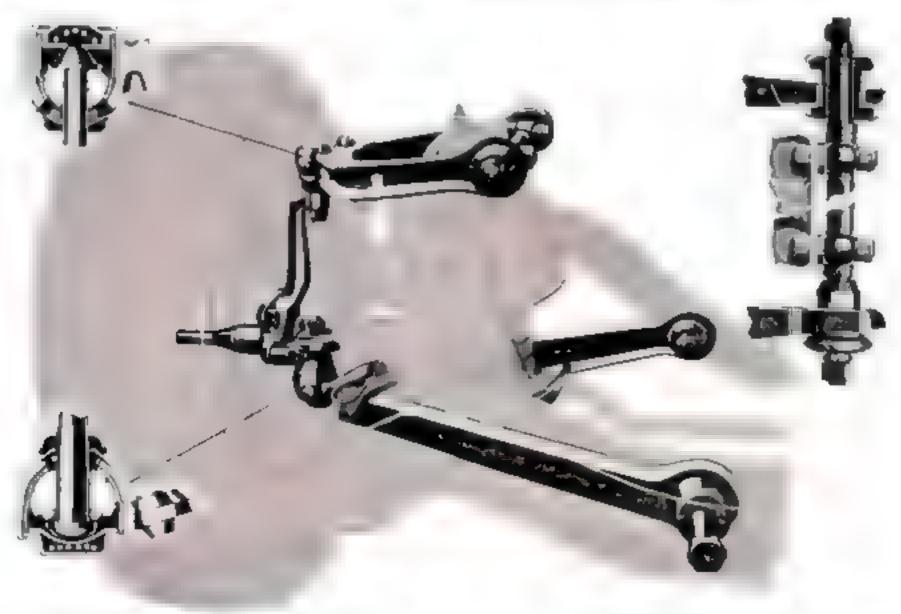
To tell the full truth, at low car speed the new carburetor will do more for the motorist with a manual transmission than for the man with automatic drive. To get a proper mixture, you've got to have a good air flow. For a good air flow, your engine has to rev up and pump faster. With Mercury's automatic transmission, the slippage at low car speed and hard throttle lets the engine rev up instantaneously. But when you hit the accelerator at low speed in a gearshift job, the straight-through mechanical connection between the engine and rear wheels holds down the r.p.m. and the air flow



**BUMPERETIES ARE CANTED.** Supported by not one, but two, horizontal members, they're designed to ride up on the rear bumper of the car ahead instead of locking.

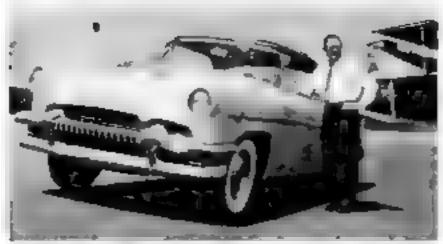


some styling steight of hand is evident here. The rear end of the '54 Mercury iun't any lower. It just looks that way, Over-all length is up 1 1/4 inches and car is lighter.



THE NEW SUSPENSION uses a single forging, for upper and lower ball joints, in place of

the kingpin, spindle and spindle support. This advances oil pan for better cooling.



LINES OF THE NEW 108 are good. It had 600,000 miles of road test before introduction. In background you can see Indianapolis Speedway's new steel grandstand "A."

-with the ordinary carburetor-until the car gradually picks up speed.

There's another little convenience built into this carburetor. If you stop at a roadside stand on a hot day you may have trouble getting your engine started again. That's because raw gas has boiled out of the float bowl into the manifold.

The '54 Mercury solves that one by putting an overflow tube on the bowl so the gas can boil away to the outside air.

The new engine is lower in the chassis—a by-product of a new front suspension. Mercury has the first ball-joint mountings for the front wheels in the medium-price field.

With ball joints you throw away the conventional spindles and kingpins. The ball joints are self-aligning. Up-and-down wheel travel is increased for a softer ride.

Ball joints wear less. They reduce the



THE CAR WILL TOP 60 with an automatic transmission in 18 accords, compared with 21 in '53. Behind it is the spot where I went over the wall in the 500-mile race in 1931.

steering effort. And instead of 16 places on the front suspension where your service-station man had to reach with a grease gun, now there are only four, exclusive of the tre rods. Everything else either is in rubber or is factory-lubricated.

Since the ball joints let the designers put the suspension-arm outer pivots closer to the wheel, the upper-arm inner pivots could be moved outboard. That increased the space in the engine compartment. So they lowered the engine.

Mercury will continue to offer power steering and power brakes and, for '54, air conditioning. They're also offering a model with a top that's half glass.

When the industry began manufacturing cars without center posts in 1950, they called them "hardtop convertibles." What will they call this new one—a transparent convertible?

#### **FACTS ON '54 MERCURY**

Model: Sun Valley hardtop.

Engine: V-8 valve-in-head 161 hp at 4,400 r p.m.; compression ratio 7.5.1 piston displacement, 256 cm in piston travel (in feet per car mile at 20 m.p.h.), 1,380 hore and stroke, 3%" by 3.7/64" crankshift bearing surface, 35.91 sq. in , torque, 238 lb.-ft at 2,200 to 2,800 r.p.m.

Weight: 3,434 lb, (approx.); per hp., 21.3 lb.

Transmission: Mere O Matie torque converter; rear-axle ratio, 3.54 I

Steering ratio: 25.4.1, radius of turning circle, 20%.

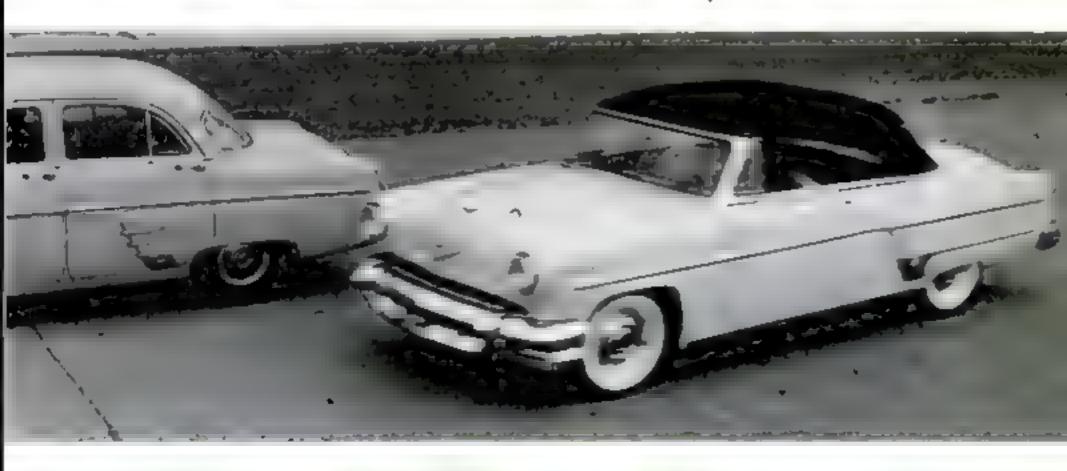
Effective brake-lining area: 159 sq. in.

Springs: front, coil, rear, semi-elliptic Outside dimensions: height, 60%", overall length with "bumpers and guards, 208-13/64"; width, 74-13/32"; wheelbase, 118"; overhang, front 36-45/64", rear 51%", tread, front 58", rear 56".

Inside dimensions: seat-cushion width front 58 29/32", rear 48%", leg room, front 42 13/16", rear 38"; headroom, front 35 13/32", rear 34 13/64"; seat height, front 13%", rear 13%"; vertical distance, steering wheel to seat cushion with seat in rear position, 5%"; front-seat adjustment, horizontal 4%", vertical 2%".

Tire size: 7 10 by 15.

Ford-Merc's high-society cousin keeps horsepower at 205 while improving brakes, carburetor, fuel pump and suspension.



# Lincoln Tones Up Performance for '54

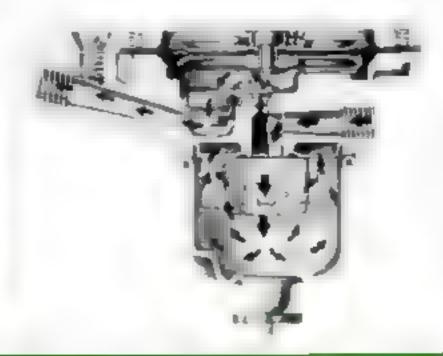
ONE of America's fine cars may slip through the year-end fanfare of 1954 announcements with only a passing mention. There will be a good reason amid a general boost in horsepowers, it has exactly the same as it had in '53

The Lincoln, a "sleeper," as they say out of the corners of their mouths at the pari-mutuel machines, still has 205 horse-power. It still rates among the best cars in low weight-per-horsepower. This year the designers have concentrated on making it a smoother automobile.

"You can put in a lot more power," ex-

MAGNET in fuel pump keeps small metal particles from reaching and scoring engine. Combined with filter in fuel tank, it insures longer piston and cylinder life. plained a Lincoln engineer, "or you can refine what you've got. You can't do both in the same year."

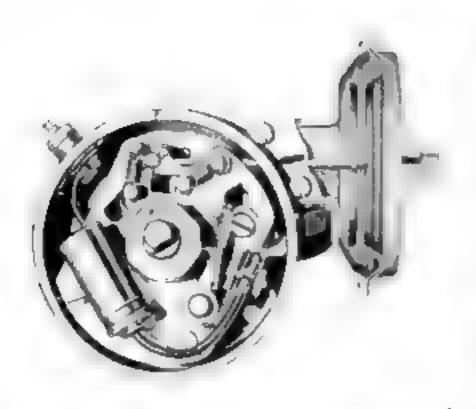
Changes have been made. The brakes



HIGHER OIL LEVEL in reservoirs of hydraulic tappets climinates clicking noises when engine is cold. Note height of tappet inlet hole for '54 compared with '53 (arrows).

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soost in size of vacuum disphragm that responds to intake manifold pressure improves spark timing. Supplementing mechanical linkage, it gives hig advance for take-off.

are bigger. At 50 miles an hour the carcan be stopped in six and a half carlengths less than last year for any given pedal pressure. At 70, it's eight carlengths less.

Like the Mercury (see p. 138), the Lincoln has an improved four-barrel carburetor. The spark advance has been attuned more precisely to the demand for push at the rear wheels. A sediment filter, good for the life of the car, is installed in the gas tank. A magnet in the fuel pump picks up any microscopic bits of metal before they can reach the engine.

The carburetor linkage has been al-

tered for smoother acceleration. The engine mounts are changed so that engine vibration won't set up sympathetic rattling in other parts of the car.

That's a tidy design feat in itself. Mountings must offset vibration at 400 to 425 r. p. m. That's the minimum number of revolutions permissible to take care of engine cooling, power steering, the transmission pump, generator output and even air conditioning

The immediate predecessor of this engine, by the way, finished one-two-three-four in the 1952 Mexican Road Race and was first in its class in the 1953 Mobilgas Economy Run.

Reinforcements make the front-end sheet metal and the steering column more rigid on bumpy roads. The balljoint suspension on the front wheels has been touched up.

The Lincoln continues to understeer. The company believes that a car should be built so that it has to be held in a turn. It considers oversteer—the anxiety of the front wheels to lead into a turn with only light steering-wheel pressure—dangerous.

For '54 the performance remains excellent. In Drive 3 Hydra-Matic position, it accelerates from a standing start to 60 miles an hour in 12.8 seconds. It will go from zero to 80 in Drive 3 in 21.6 seconds, and in Drive 4 in 22.9 seconds. For passing, it accelerates from 50 to 70 miles an hour in 8.6 seconds.

#### FACTS ON '54 LINCOLN

Model: Lincoln convertible.

Engine: V-8 overhead valve: 205 hp. at 4,000 r p.m., compression ratio, 8:1; piston displacement, 817.5 cu, in.; piston travel (in feet per car mile at 20 m.p.h.), 1,379; bore and stroke, 3.8" by 3.5"; crankshaft bearing surface, 43.49 sq. in.; torque, 305 lb.-ft. at 2,300-3,000 r.p.m.

Weight: (shipping) 4,310 lb.; per hp.,

Transmission: Hydra-Matic; rear-axle ratio, 3.31 1

Steering ratio: 26:1 manual, 21 3 1 power; radius of turning circle, 22.7

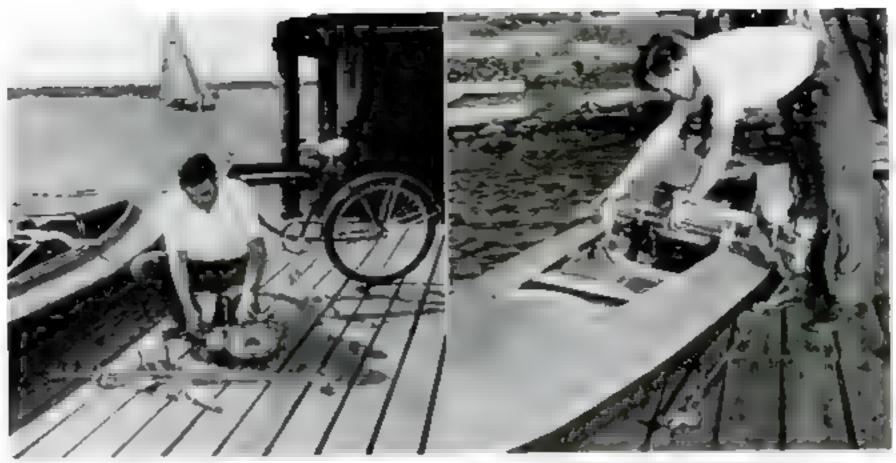
Effective brake-lining area: 220 sq. in.

Springe: front, ball-joint individual coil, rear, semi-elliptic.

Outside dimensions: over-all height, 63.1"; over-all length with bumpers and guards, 214.8", width, 77.4"; wheelbase, 123"; overhang, front 37.5"; rear 54.3"; tread, front and rear, 58.5".

Inside dimensions: seat-cushion width, front 62.3", rear 59.7"; leg room, front 44.3", rear 38.1"; seat height, front 13.5", rear 12.5", vertical distance, steering wheel to seat cushion with seat in mid-position, 4.9", front-seat adjustment (power), horizontal 4.3", vertical 1.5"

Tire size: 8.20 by 15.



#### Diesel Bike Engine Goes to Sea as an Outboard Power Plant

A MARINE conversion kit puts the Lohmann diesel bike engine (PSM, Dec. '53, p. 81) on the water. Available only abroad, the kit includes a mounting bar, a round fuel tank, propeller and shaft, and ropestarter pulley. Fuel pellets are burned in a shield clamped to the cylinder to heat the engine for rope starting. Made for European boats, which have tillers, the engine mount itself affords no means of steering.



#### Tool Fells Trees Hydraulically

It used to take a husky lumberjack to pound a wedge into a half-chopped tree. Now the tool above provides the muscle. A little hydraulic pump pushes a wedge into the kerf, toppling the tree with a 90,000-pound lift. The Hufford Machine Works, El Segundo, Calif., manufacturer of the Hydra-Wedge, says it is safer, too.



#### Highway Turns on the Heat

Snow will melt and ice will never form on ramps leading up to Boston's \$25,000,000 Aerial Highway. A pump and a steamfed heat exchanger at each ramp will circulate hot water mixed with antifreeze through from pipe embedded in the concrete. More than 200 tons of pipe will warm about 161,000 square feet of pavement.

# U.S. Cave Men Dig Up History of Wild West



THIS LARYMININ, a system of multileyel caves, has its opening in the side of a mountain riving from Lake Sharts, Calif. Called Stone Man, the caverns on 220 feet deep into the cartle Speloologists exploring them most not

indices and repeate lower themselves from one level to the other. On a walk - often a crawl-through the passages you would cover 1,200 feet. Explorers wear miner's lamps to light their ways.

Scientists are discovering the dusty remains of people and animals hundreds of centuries old.

#### By Andrew R. Boone

WHAT life was like hundreds of centuries ago in California, Nevada and Arizona is being found out, bit by bit, in the dust of dozens of caves

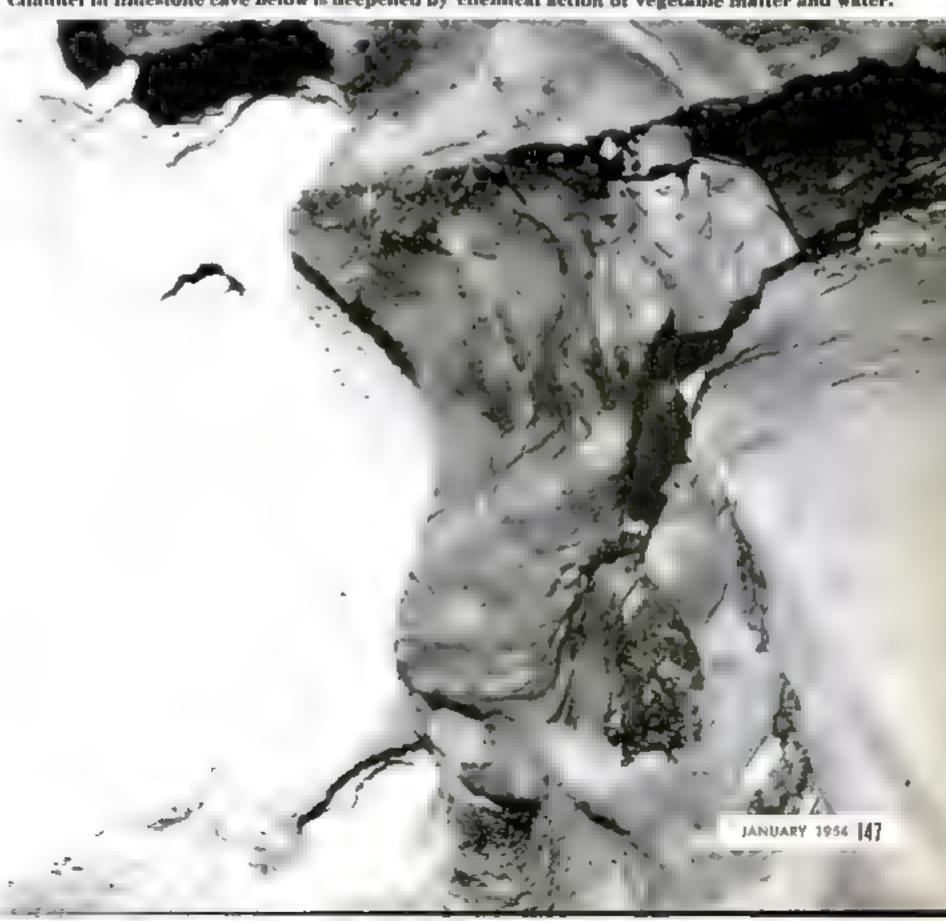
in that part of the U.S.

The discoverers are a group of young men who are probing into the past with homemade scoop shovels, fine whisk brooms, jeep-drawn drags, giant vacuum cleaners and electric hammers. They are called speleologists—scientific underground explorers. The amateur variety of the same species is called a spelunker.

The speleologists are devoting themselves to



Channel in limestone cave below is deepened by chemical action of vegetable matter and water.





Map-making machine, in use at left, is a combination plane table and artillery gun spotter.

mapping, exploring and conserving all known caves in the three states, and finding new ones when they can. They have already added considerably to man's knowledge of the underground. Also, because ancient peoples and animals, careless or inquisitive, jumped or fell into these holes in the earth long centuries ago and ended their days there, the speleologists have found out a lot about what went on above ground.

Already they have discovered the remains of prehistoric men, horses and camels lying together, thus proving for the first time that they lived at the same time and in the same place. They have

#### Relics Reveal Centuries Old Secrets



SPELEQUOGISTS above examine the dry bed of Lake Lahontan, Nevada, for trophics of the past. A portable gas engine powers fan that sucks dust from the pit.



WELL-PRESERVED willow baskets, found under 30 inches of debris, are carefully dusted off. They were made by unknown Indians, perhaps 100 centuries ago.



HUMAN THIGHBONE (arrow) is shown embedded in 3 by inches of cave deposit in Mouning Cave, Calif. Bone's age, figured by counting rings of deposit, is 2,494 years.

also unearthed ample proof that the far westerners of 10,000 to 30,000 years ago were not as primitive as they had previously been thought to be.

They have found the fossil remains of a rare ground sloth that lived in caves



finger points to drip in ancient staluctite formation, in Cave of Skulls, Calif., that took 98 years to form. Purent formation was broken off by vandals in 1853.

while the last glaciers were melting.

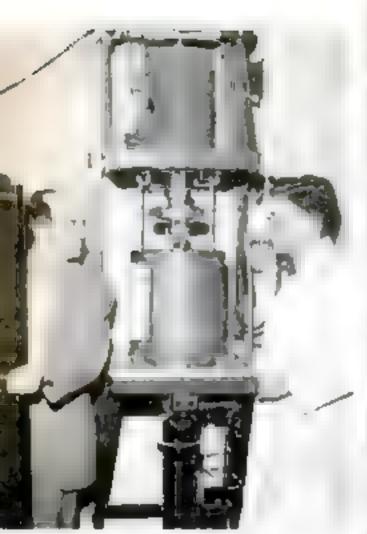
Moreover, the speleologists have come across the bones of two prehistoric citizens who stood six feet four in their bare feet. Westerners evidently were running tall even in those faraway days. END



UNDER THE BASKETS, scientist finds a cedarbark robe, then the skull of an average-size mammy. The robe was used as a burial shroud in ancient days.

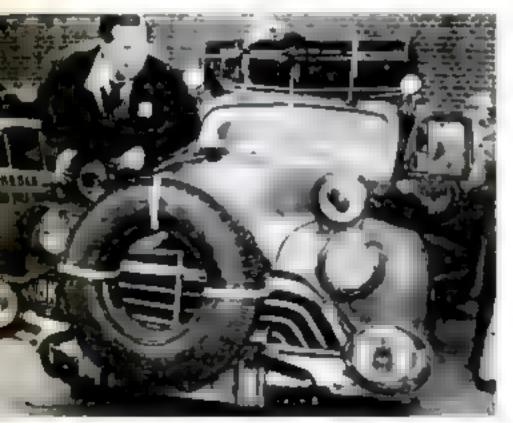


ON LAKE SHORE near the diggings, speleologist gives a whisk-broom brush-off to the remains of an adult female minimity. It is one of the oldest found in U.S. to date.



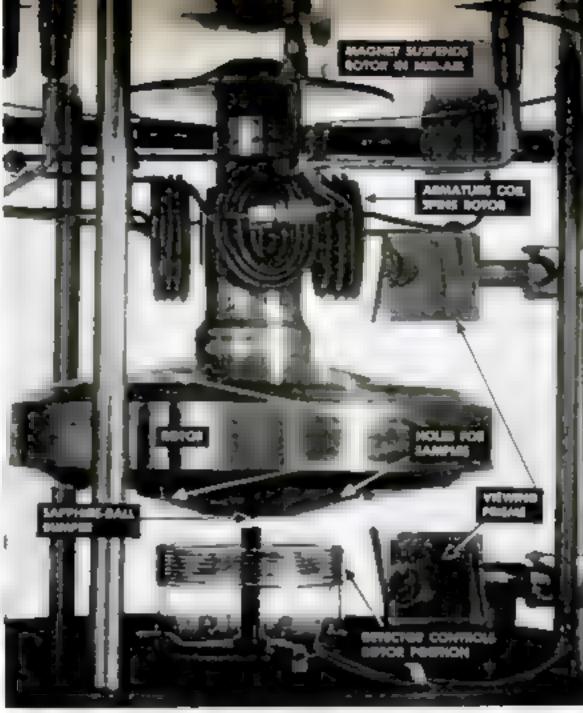
#### Scientific Top Can Spin for Seven Months

THERE'S no visible means of support for this scientific top, the world's largest ultracentrifuge. An electromagnet suspends it in mid-air (really in a vacuum), and a varying magnetic field spins it at 30 000 r.p.m.,



#### That Spare's for Kangaroos

A KANGAROO catcher was added to this stock car for the 8,500-mile trip in an Australian road reliability test run. The car above has a spare tire taped at the front to gently bounce the animals from the road. Wire mesh guards protect the headlights.



creating a centrifugal force 100,000 times gravity pull. Made at the University of Southern California for research on molecules, it would take 208 days to stop spinning if not braked.



#### **Factory Becomes Playground**

At the noon lunch break, plane builders at North American break out the recreation equipment for a daily workout. Cleared blueprint desks become table tennis courts and assembly-line aisles turn into shuffle-board and horseshoe pitching areas.





Not only cars are muffled, but even dogs and bullfrogs, in America's quietest city.

#### By Robert Lasch

THE bullfrog is a respected creature of the South, but when one unleashed to mellow buritone within the city limits of Memphis, it tangled with the law.

Bullfrogs are not allowed to croak in Memphis, dogs are forbidden to bark, and auto horns to beep, except in case of emergency. The law, which first laid down these bans 15 years ago, is the Tennessee metropolis' famed noise-abatement ordinance.

Memphis has proved conclusively that at least some of the nerve-racking, incer-incubating sounds that result when thousands of people live and work together are unnecessary. For 11 straight years the mid-South capital on the banks of the Mississippi has won the top award for municipal silence granted by the Noise Abatement Council as "the nation's quietest city."

How quiet is Memphis? Your correspondent went there to find out—and it is really quiet. The yawp of an autohorn is so rare that you notice it. On a busy Monday, with Main Street crowded and the cotton merchants thronging Front Street, I heard an autohorn just three times in 12 hours; twice the offender was an out-of-state ear or truck.

Heavy traffic moved smoothly along





MOTORISTS entering Memphis get briefed on antinoise ordinance at city limits. In the

photo above, police are shown stopping cars on Missusippi River bridge.

downtown streets with an unnatural hush. The horses of the mounted traffic policemen softly picked their way on rubber horseshoes.

In Court Square and Confederate Park, overlooking Wolf River at its junction with the majestic Mississippi, people walked and talked in a subdued and leisurely way that matched the generally unfrantic pace of the city as a whole. Measured by sound, Memphis seems like a town of 15,000 rather than a fast-growing city of 432,000.

#### Cops Clamp Down on Croaking Frog

So it was easy to understand how, in one of the notable cases under the antinoise ordinance, a nature lover had been fined because the bullfrog he brought back from a fishing trip tuned up on a moonlit night to the discontent of the neighbors.

After eight p.m., Memphis is as quiet, practically speaking, as the grave. People there value what the antinoise ordinance feelingly describes as their "quiet, comfort and repose."

To protect this quiet, comfort and repose, the ordinance bans all "loud, disturbing and unnecessary noises." And it spells out what it means: Auto horns, except to prevent an accident. Blaring

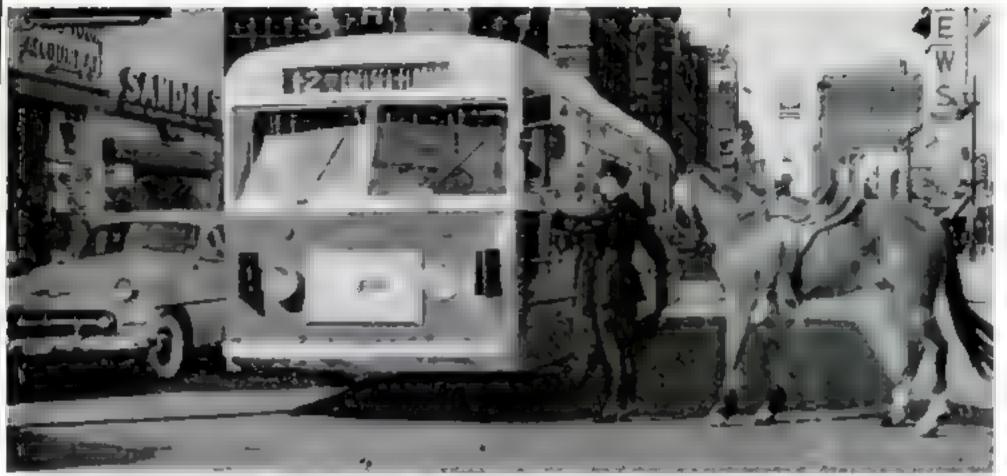
radios. Yelling, shouting, hooting, whistling or singing. Animals, birds or fowls given to frequent or long continued noise. Unmuffled exhausts. Train whistles, except briefly at a grade crossing. Industrial clatter, Off-hours construction activity. Commercial sound trucks. And so on and on.

#### Well-Rested Tourists Are Impressed

Memphis citizens firmly believe that they are healthier because of the hush in their communal life. They are certain that, whatever the physical results, they enjoy more peace of mind. As proof that they have attained something of genuine value, they point to the long line of tourists passing through who, after a silent night of deep sleep, have written their thanks to Memphis officials while simultaneously chewing out their town fathers at home for not doing as well.

Memphis believes, too, that putting the silencer on urban clamor yields incidental benefits that are not to be sneezed at.

The police love to tell about three fugitives from San Quentin prison who blew into Memphis after staging a series of bank robberies in Mississippi. The exhibitanted thugs noted a couple of pretty girls on a downtown street and



MOUNTED COP climbs down to give bus driver "quiet" warning. Clop-clop of horses' hooves

is outlawed, too; police department steeds wear tubber shoes.

gave them the time-honored salutation a long blast on the horn of their car, accompanied by leers, whistles and arm wavings.

Two cops walked across the street, intending to remind the visitors of the antinoise ordinance. The thugs took fright, drew guns and tried a getaway, but Memphis' finest clapped them into juil and ultimately dispatched them back to San Quentin.

Then there was the time when a police inspector on his way home to dinner met up with a motorist who was furiously blasting his horn. The inspector stopped this offender, who contended that he was merely sending a message in Morse code. One thing led to another, and the upshot was the discovery of an expensive counterfeiting layout in the man's room, all set to pour out a flood of phony five-dollar bills.

#### Editor Started Campaign

But, handy as it is, catching stick-up men and funny-money artists is not really the business of the antinoise law. Its business is silence, and it began with the ruminations of an editor, Ralph Millett of the Memphis *Press-Scimitar*. Millett had been put on the mailing list of a national antinoise organization. He was

something of a crank on the subject. Observing that noise is local, he began to bear down, in print and in private conversation, on city officials.

A battle of sound trucks gave impetus to Millett's campaign. One day six of these vehicles, representing competing retailers, met at a downtown corner. Each being unwilling to yield the right of way to the others, they proceeded to step up their amplifiers in a gracking contest to drown each other out. The



ANTIRACKET PLACARD decorates police prowlear during Noise Abatement Week. If warning doesn't work, long arm of law muffles noisy offenders with stiff fines.

#### Everybody Helps Say "Sh!"



WINDOW DISPLAY sounds off at motorists who blast Memphis' churchyard calm.



INDUSTRY-SPONSORED billboard reminds passers-by of healthful effects of quiet.



STERN MANIKINS in store window symbolize dim view cops take of unwarranted racket.

citizenry clapped hands over ears and screamed for quiet,

So Police Commissioner Joe Boyle decided to sponsor an antinoise ordinance.

According to Boyle, who is now Finance Commissioner, the secret of Memphis' success lies in steady, unrelenting enforcement. He scoffs at the idea of doing anything about noise by "voluntary" methods.

At first the citizenry cried out against the three-dollar fines—or 11 dollars if they were so brash as to demand a trial—which the courts regularly assessed for the mere blast of a horn. They indignantly protested that one ordinance required them to have a horn, while another forbade them to use it.

#### Silence Takes Sting from Fines

But after a while the complaints died away, and most people decided that they liked the new silence more than they disliked the fines. Vice-Mayor Claude A. Armour, who has succeeded Boyle as commissioner of silence, says that opposition now is almost nonexistent. On the average, 300 arrests a year are made, and countless warnings are issued.

If most of the weight has fallen on random horn-blowing, that is because sound tests showed this noisy device to be the worse offender against rest and repose.

At the outset of the campaign, sound engineers measured the ordinary hum of traffic at the downtown intersection of Main and Madison as 14 decibels.

That is not really noisy when compared with the New York subway (100 decibels), a steel-nveter at work (95), or even a lion roaring good and loud (90).

But the interesting thing was the increment which various sources added to the basic Memphis street noise. A single passing auto raised the reading to 18 decibels. A streetcar raised it to 24. (All the streetcars have since been replaced by trackless trolleys, the quietest things on wheels.)

One blast of a nearby auto horn did

[Continued on page 246]





#### Tennessee Bridge Wins Beauty Contest

SIMPLE, coherent and restful to the eyes, explained five judges when they gave this bridge top honors in the American Institute of Steel Construction's 25th annual bridge competition. One of three winners-the others were the Neches River Bridge in Beaumont, Tex., and a lift span in Miami, Fla.-this Morris Ferry Bridge spans the Elk River in southern Tennessee. A stamless-steel plaque will tell motorists who use it that it has been adjudged the most beautiful structure of its class (costing less than \$500,000) completed in 1952.

#### TV Tower Matches Modern House

Tailored to the modern ranch house at left, this 36-foot TV tower is far more sightly than a latticework of steel, and has stood the test of near tornado-velocity winds. Its builder, J. R. Darrow, of Polo, Ill., shaped X" tempered Presdwood board over a sturdy frame of two-by-twos.



Stiding partition sieings down to become a during table.

LETTER T-FOR-TABLE is bamille for pulling out oversize solub-core brech door panel from sliding walnut frame. The f then becomes leg for during table (below).



# Scrapbook of Ideas Helps Design a Home

H OW many couples have moved into a new dream house only to exclaim, "Oh, I wish we'd made the fireplace of bluestone instead of brick!" or, "Why didn't we plan for built-in bookcases in the study?"

Not so with the Merle H. Millers of Indianapolis. For almost two years before they started building their new home, Mrs. Miller pasted clippings of things and ideas she liked in a scrapbook.

Into this book-of-things-to-come went such items as: a plan for a work-at-home area for Mr. Miller, with space for typewriter and filing cabinets; a private guest suite that would serve their older son as headquarters when he was home from college; a light workshop; soundproof sliding doors to separate the sleeping wing from the rest of the house.

When the time came to discuss sketches with the architect, the Millers knew pretty much what they wanted.

Some of the ingenious results of their pre-blueprint planning are shown here and on the next page. Whether you are planning a new home, remodeling an old one or just want to build something useful, the Millers' ideas for built-ins may pay off for you, too, in better living.

Dressing-table top tilts up to hold a lighted mirror.



WHEN TERRY lifts up this vanity-mirror panel on a miniature version of mother's dressing table, she's all ready for primping. Rubber friction catch holds mirror up. Louvers at right of bench are drawers.



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Pull-outs provide storage space that is easy to get at.

LESTER demonstrates easy-reach towel trays in children's bathroom. Like all the kids' furniture, cabinet is built to small-fry scale. At upper right are Daddy's shirt shelves; lower right, racks for table linen.





Some doors need no handles. On others, handles show what's inside.





NO BENDING to open kitchen-cabinet base doors (left). Foam rubber on bottom protects shoes. Shelves slide out. Cutout wooden letters on each built-in identify its use or user. TR above stands for toolroom.

# Id Like to see them make...

Everyone has his awa put Idea of some godget he would like to see in general use. What is YOURS? Fopular Science Monthly will pay 55 00 for each one published. Use government postcoids only Cantributions connot be acknowledged or returned.



A HEATED BED JACKET, wired like an electric blanket, for convalencents and people who like to read in bed after the furnace has been turned down.—Oscar Levin, Brooklyn.



**GREASH GUNS** of the high-pressure type that would take throw-away cartridges like calking guns, chiminating that messy packing job.—H. Clough, Boulder Creek, Calif.



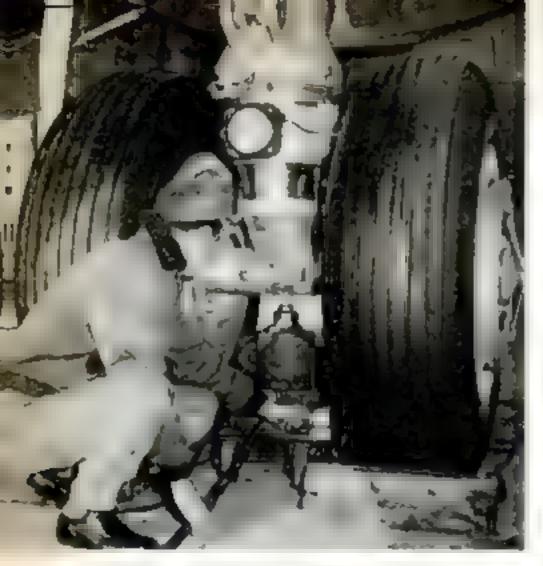
toose-leaf paper with built-in reinforcement at the holes. A plastic strip bonded to the edge would make a tearproof page for heavy-duty use.—P. Alden, Montelair, N. J.



A WINOSHIELD SCRAPER that would heat up when plugged into a car's eigerette-lighter socket. It would do a fast job of cleaning off ice.—David Trump. Ames. Iowa.



A REFRIGERATOR with a fireproof vault built into its base so that a householder could rafely store valuable papers at home.—Mrs. Edward Zavadnik. West Branch, Mich.



#### **Jacks Prevent Plane Flats**

Bic bombers like the B-47 are hard on tires, even when they're standing still. Now, instead of moving a grounded plane at intervals, to put its huge weight on new sections of the tire treads, small motor-driven jacks are wheeled under the landing gear. The plane then is lifted, and its wheels turned to fresh tire areas.



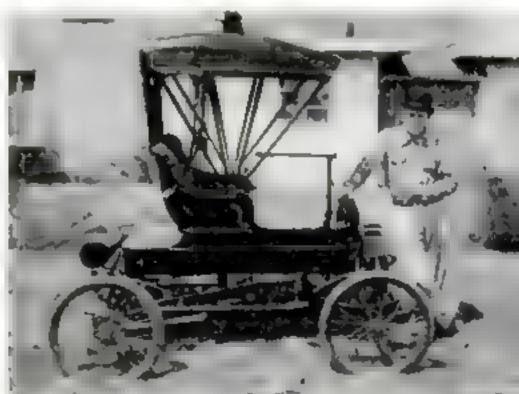
#### Wiring Is Speeded by Crosses

PLASTIC strips with tiny "tombstones" spaced at intervals along one face are cutting costly man-hours from the job of wiring Boeing planes. When wire bundles are wrapped around the crosses and secured with string, the "tombstones" make short-circuit-free, easily installed hangers which are reported superior to metal clamps.



#### Giant Bridge Outgrows Factory

Brince prefabricators had to take this job outdoors. It's one truss of a 5,200-ton bridge soon to span 20 railroad tracks, a highway, a canal and a river at Akron. After assembly and checking by Midland Structural Steel at Hammond, Ind., the trusses will be taken apart and shipped to the site on 250 freight cars.



#### Built His Own "Old Olds"

A MACHINE-SHOP proprietor with a yen for the past built this horseless carriage around a surrey top and a power-saw motor Resembling a 1903 Oldsmobile, the runabout is the work of LeRov Freek of Hillsboro, Wis, Its archaic design is only tin-deep; the buggy rolls along at a snappy 18 miles per hour.

## How a Yale scientist, sort of by mistake, caught



DOWN BUT NOT OUT, Yale University's recordbreaking, ton-and-a-half-plus manta is towed to a Peruvian port. After hours of battling, it was exhausted but still breathing.



Att THE TOWN'S MEN couldn't had the enormous sea beast up the beach at Cabo Blanco, Peru. Three trucks took turns at the Job before the devillish was out of tide's reach.



SCHOOL WAS LET OUT so that the kids of Cabo Blanco could get a vivid lesson in natural history. With those two fins at lower left, the ray swept small fish into its mouth.

# World's Biggest Devilfish

#### By Gardner Soule

"WE HAD fought a manta ray for four and one-half hours off Africa," says Ed Migdalski, a museum technician at Yale University. "so I knew what it was like to try and get one.

"It was hell."

The African manta got away. But Migdalski and a crew from Yale University tried again, and landed their next one off Cabo Blanco, Peru, not long ago.

The manta ray, the devilfish of much fiction about the ocean, is also named the sea bat. A huge, flat fish, he grows up to more than 18 feet across, or from wing tip to wing tip. His flapping fins at each side are called wings. He swims very powerfully, as does the shark, to which he is related. And even while his life ebbs from a harpoon barb inside him he is likely to have enough of his strength left to pull a boat over the ocean.

#### Goes Fishing for Exhibits

Migdalski was down off Peru gather-, ing specimens for Yale's new Hall of Fishes. A preparator, he has to collect and make plaster molds of specimens. Later he paints the resulting casts in natural colors and prepares them for exhibit.

Looking back on his struggle to catch and land the manta and make molds of him, Ed Migdalski today feels exactly as Mammoth manta ray was shot, hooked and finally roped in—still alive.

he did the day the battle took place. "I never thought we'd do it," he says.

That's partly because it was such a struggle to land the big bat fish, and partly because Migdalski had no intention of trying to catch a big one. An ordinary sample would have suited him fine, But, he says, "we just happened to get into a fine mess of them. We saw five or six that day.

"A Peruvian native with a harpoon was standing on the starboard side of the bow of our fishing boat, the Suzanne V, captained by Bill Fagen of Miami.

"I was on my knees behind the native boy, holding on to a five-gallon drum. A hundred fathoms of quarter-inch manila rope was wound around the drum and attached to it on one end. At the other end the rope was attached to the harpoon.

"At about three p.m., the ray was spotted, to starboard, close alongside the bow.

"At 3:02, the boy sank the harpoon into the middle of his back."

#### Devilfish on a Rampage

Crisis No. I happened instantly—the first thing the manta did.

Migdalski expected the ray to swim away from the boat. Instead, the devilfish crossed the bow. The rope was jerked across the bow deck with such force the native could have been injured or swept overboard. Migdalski screamed at the boy to duck under the rope.

He did-in time.

Crisis No. 2 came a split second later. The drum, with all the power of the ray hauling it, could have crashed into and carried away the rail on the port side. Migdalski with all his strength heaved the keg from the starboard of the vessel over the port rail. It cleared by inches.

The ray sped across the Pacific. He



MAKING AN IMPRESSION for Yale's new Hull of Fishes. Ed Migdalski pours plaster over the dead body of the manta ray as it lay in the sun. The plaster quickly formed a nield.

churned a great white wake on the surface. The Suzanne V pursued,

"We followed the ray for miles," says Migdalski. "The rope paid out rapidly from the drum.

There was a slight chop on the sea, but it was easy to keep the ray in sight, what with the drum and that huge white wake and the spray.

"Finally we caught up with the keg and took it aboard."

Then an hours-long fight began.

"The ray would stop," Migdalski says, "and we would pull in more rope as vigorously as we could. We were really putting it to him. We had to exhaust his strength.

"We couldn't let him rest."

Crisis No. 3: 'The rope got all fouled up on deck, Anyone could have been caught in it and dragged overboard. "I kept an open knife right by my hand all the time, in case someone should get the rope around an arm or leg," Migdalski recalls.

#### Hail of Bullets Fails to Kill It

"Sure, we had our procedure all planned, but this thing was so big—so big that things happened so we couldn't go according to plan."

When they got close enough, they shot the ray. "Bud King, an angler on the ex-



WHAT A WINGSPRIAD the huge devilfish had is well indicated by a measuring line of curious children. They are watching Migdalski plaster stiffening rods to the manta's mold.

pedition, was standing by. When he could, he shot at the ray with a .38 revolver.

"Nothing happened.

"Bud hit him in what would have been vulnerable spots for any other animal. He riddled him with ammo. He didn't kill him."

Now the boat drew up alongside the giant fish.

Crisis No. 4.

When the ray was near the side of the boat, a huge wing would come flapping and crashing over the rail.

#### Wounded Ray Keeps Crew Hopping

Everyone had to sidestep, hop, jump or run to duck the blows that might have meant a nasty wound.

"Then," says Migdalski, "we tried to

gaff him.

"We would get marlin gaffs, big iron hooks, into him and he would straighten



MEADED FOR NEW HAVEN, the first of four molds of the manta ray is lifted off the monster's carcase. The molds, too large for a fishing boat, traveled to U.S. by freighter.

#### Devilfish captor also landed a monster of another kind.

Ed Migdalski caught another recordbreaking fish on the same trip when he caught the ray. It was an arapaima gigar

(right), If you haven't heard of that critter, don't be surprised, for none had been caught by a white man in almost 40 years, This is probably the first photo of an arapauna, the world's biggest fresh-water fish, ever printed in the U.S. Migdalski landed it in British Canana on a 12-to-15-pound line. The giant, prehistorictype fish is considered a record for such light

gear. Those scales on the arapaima are olive green, and halfway back to the tail they begin having red edges.

Migdalski also caught many piranhas, the flesh-eating fish of South American rivers; a 27-pound, black, orange and white catfish, and an electric cel. Asked to comment on his 1953 luck, Migdalski said, "I'd rather fish

than eat. I love to eat 'em. I love to work with them. I feel I am more closely related to a fish than to most people "

Besides Migdalski's catches, the Yale expedition to South America brought back a number of big-game fish, which the expedition was studying; several thousand specimens of Humboldt Current fish, including some un-

known varieties; and a wealth of information about the Humboldt Current itself.

The scientists estimate that it will take them three years to correlate their findings and study the specimens.



them right out. We lost five gaffs that way."

That was all the gaffs they had. How could they bring in the devilfish without gaffs?

The sapping wings, crashing over the

side, provided an idea.

"As the wing came over," says Migdalski, "two natives would try to grab and hold onto it. I would gouge it with a kinfe. After many tries, we got a hole in the wing.

"Then we got a rope through the hole,

and tied the wing securely.

"Finally we got a rope around his body. No, I don't know how we did it, but we did. It took about an hour and a half to tie him up. Then we dragged him astern into the harbor.

"As we entered, I looked at my watch It was 20 minutes to 11." Seven hours and 38 minutes from the time the harpoon landed, The barpoon, a native one, had a wooden handle about six feet long and a small (four-inch) harpoon barb. Even though the ray had straightened markin gaffs as easily as you bend a paper clip, that native harpoon had held.

The ray was still alive, He died that

night in the harbor.

"No," says Migdalski, "the heat wasn't bad that afternoon. We wouldn't have noticed it, anyway."

#### W hole Town Tries to Haul in Catch

Next day, the rope towing the manta was transferred from the Suzanne V to a motor launch. The launch hauled the ray to a pier.

Natives took over the rope in an effort to haul the ray ashore. They could pull the manta through the water, all right, but not up the beach.

Cabo Blanco's school kids were let out,

[Continued on page 278]



#### Longest Rails Snaked 850 Miles to Location

That young Northern Pacific's sharpest 12-degree curves as easily as boiled spaghetti, eight half-mile lengths of welded rail made history when they were wheeled 850 miles from Big Turber Mont to the road's Stimpede Turarel near Scattle. The longest "packages" ever shipped so far the rails traveled on 60 open end ballast cars. They will eliminate clacking points out maintenance in the two-mile tunnel.

# Educated Gas Pedal

#### **Keeps the Cops Away**

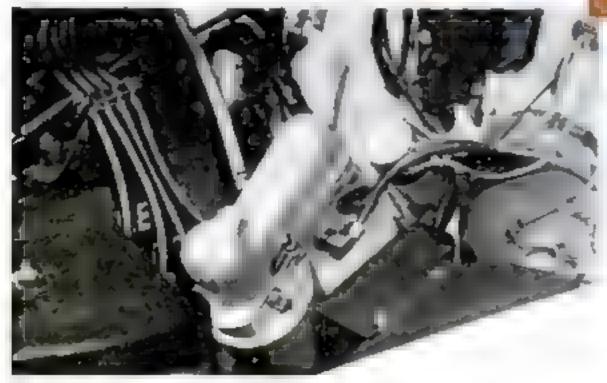
By Frank Rowsome Jr.

IF YOU have an errant impulse to drive with your right foot in the glove compartment, you should meet the Speed-o-Stat. This is a new and fascinating gadget—a kind of power-operated accelerator, or governor with extras. It definitely takes us several miles farther down the road toward automatic pilots for cars. You'd better meet it now, because it looks to be part of the coming auto scene.

Let's take a ride to the next city down the high-way in a car equipped with a Speed-o-Stat. You fire up and pull out of the garage as usual There is a little adjusting lever on the dash with a button nearby. The lever happens to point at, say, 35 m.p.h., about the maximum safe speed in your neighborhood. Your car handles exactly as always. If you want to be flamboyant, you can readily floor-board the gas pulling away from a light. The single difference is that now you can't conceniently drive over 35 m.p.h.

What happens, if you try, is that the accelerator pedal pushes back at you, gently at first, astonishingly hard if you don't take the hint. Up to 35, the pedal is soft as ever. Above, it can still be floor-

Speed-o-Stat nestles next engine, just shead of fire wall.



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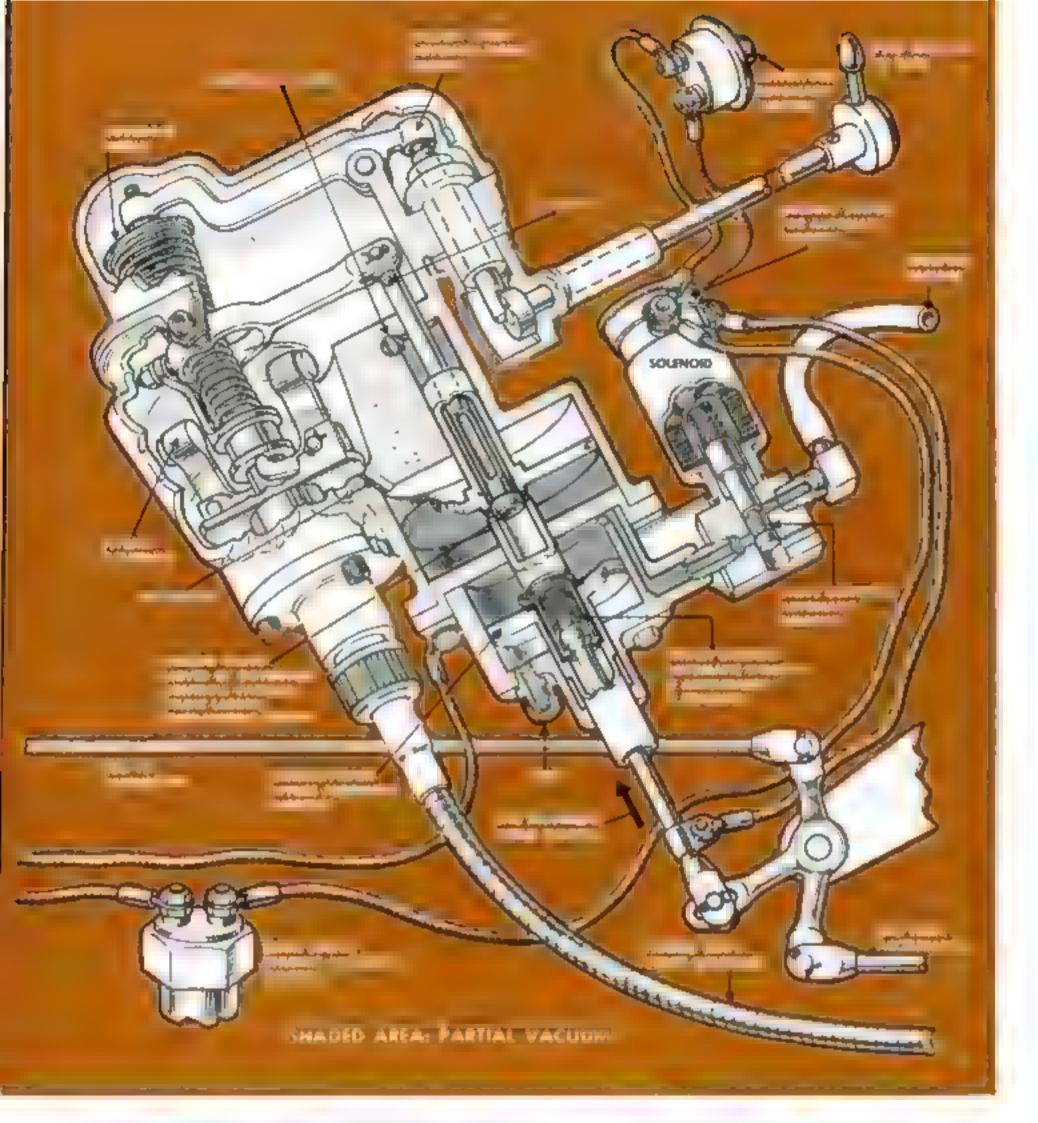






#### Here's How New

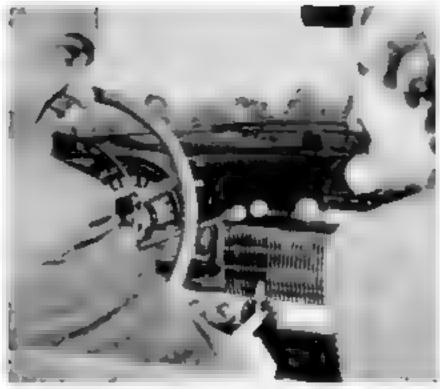
sketches directly above show operation of the speed control, drawn in detail in big cutaway. I. Setting speed on dash dial adjusts the tension on a spring—the higher the pre-set speed, the tighter the spring. As car speeds up, a flyball governor, run off the drive shaft, pushes upward more and more against the spring. When pre-set speed is reached, the governor overcomes the spring tension and moves an arm. This opens a



#### Speed-o-Stat Uses Manifold Vacuum to Control Your Speed

valve that allows the manifold vacuum to suck the air from the lower end of a large cylinder, pulling down a piston. The rod tip of this piston limits the upward travel of a rod linked to the gas pedal. To drive faster than the pre-set speed you must push down on the accelerator hard enough to force the piston up against the pull of the manifold vacuum. 2. When the car slows on hills, the governor slows, the spring tension over-

comes it and pulls the arm to the cylinder back up. This opens an air valve that desteeps the vacuum in the cylinder so that the piston can now move freely, offering no resistance when you push down on the gas pedal—until the pre-set speed is again teached. 3. The lock-up device works through a smaller piston lined up end-to-end with the large one. Setting the dash lock-up switch signals a solenoid to open a valve that allows the manifold vacuum to pull air out of the upper end of the smaller cylinder. This moves a piston up in this cylinder until the projecting end of its rod butts against the rod tip of the piston in the bigger cylinder. The smaller piston can never overcome the push of the bigger one, but it keeps tight up against it. The rod of the smaller piston is linked to the throttle, so it keeps the throttle as far open as the big piston will allow.



DRIVER is pointing to speed-setting dial on the dashboard. Above it, slightly to left, is control that locks up the device, acting as a "phantom foot" on gas pedal.

boarded, but you have to invest 30 to 50 foot pounds into overriding it. This is an effort that can be put out for a short time by even a fairly flimsy woman, but it tires you fast. So you just don't go over 35.

By now you have threaded out to the intercity highway. It is placarded at 55 and the state cops leave you strictly

alone up to about 60. You reach over and tweak the Speed-o-Stat lever to 58. Instantly the lower-limit pedal resistance backs away until she gets

up to speed. Then the pedal starts giving you that same take-it-easy-Mac business if you try to overdo. Notice that the gizmo is sensitive to road speed, not revs. If you downshift, the gas pedal frees up and gives you no back talk until car speed comes up to the governed setting.

Now that you are wheeling all alone down the concrete, touch that button beside the lever and take your foot off the gas. This puts you into "full automatic." The car holds to set speed. Your right foot is free to stretch or loll about. If you see trouble coming, touch either the brake or the gas and the Speed-o-Stat instantly unlatches, leaving you in

conventional control. She won't lock up again until you bring it back to the governed speed and touch the button.

Why. Speed-o-Stat was invented by Ralph Teetor, president of Perfect Circle, an automobile engineer who has been blind since early childhood. With the sharpened perceptions of the blind, Teetor noticed that much speeding by persons who drove him seemed to be involuntary, or at least unintentional. He observed that many drivers are not visually speed-sensitive, particularly at night, and that after a long, fast run, they often unconsciously drove way over speed limits in towns. He set out to design a driver-reminder that would have these characteristics:

 A dash control that could be conveniently set by the driver throughout the speed range.

 No interference with normal operation below the set speed.

 A warning that, in emergencies, did not offer an absolute restriction—that could be overridden in a pinch without taking time to reset the control.

How. The speed-sensing mechanism

of the Speed-o-Stat is a flyball governor, operating off the drive shaft. This governor uses the manifold vacuum to push down a big piston that

limits the travel of the accelerator pedal.

To drive faster than the set speed you must overcome manifold vacuum.

The lock-in device in effect provides a mechanical foot to keep the accelerator pedal pushed down to the limit of easy travel. To do this, manifold vacuum is used to push a smaller piston, attached to the gas pedal, up against the big one.

The disconnect works when you touch either the brake or the pedal. This breaks the electrical circuit that has valved vacuum to the smaller piston, and so releases the accelerator.

How well does it work? Very nicely. On most cars and roads, speed is stabilized within one mile an hour.

It's basic, fundamental
Advice that never fails—
The more you "choke the hammer,"
The more you bend the nails.

-BERTON BRALEY

One circumstance where the automatic control can't keep speed on the nose is on a very steep climb begun at low governed speed. The most Speed-o-Stat can do is open your throttle wide-it can't give that little climbing run a driver

unconsciously provides

On Dynaflow Buicks and other cars with scant foot-off engine drag, you get some overshoot after cresting a hill, though it rarely amounts to more than two or three miles an hour. Down a long, steep hill, cars with little drag won't hold to governed speed, since the maximum braking response Speed-o-Stat can give is to shut the throttle. But in any car or terrain, the pedal-resistance feature seems to track precisely—much better than you could hold speed yourself, even with your eyes on the speedometer.

What's it good for? The Pierce Governor Company, of Anderson, Ind., which makes Speed-o-Stat, thinks it belongs on passenger cars as well as trucks and buses. The main pitch is on safety—a tactful reminder when you hit it up unconsciously. Driving convenience and freedom from those right-leg creaks on long hauls are additional points. Peace of mind about the cops—no need to keep one eye on the mirror and another scanning the road for a trooper in the shrubbery—is another. Some gas saving is also claimed, because of even, gentle throttle-handling.

How safe is it? Mechanically, there is no evident way in which a malfunction could possibly give unexpected throttle opening. It "fails safe" in that either vacuum or electrical trouble simply leaves you with a conventional acceler-

ator pedal.

Psychologically, Speed-o-Stat may come in for criticism on the grounds that it might open the way still more for "speed hypnosis." A drowsy driver, droning along a monotonous road with nothing to do but steer, might be still more likely to drop off for 40 fatal winks.

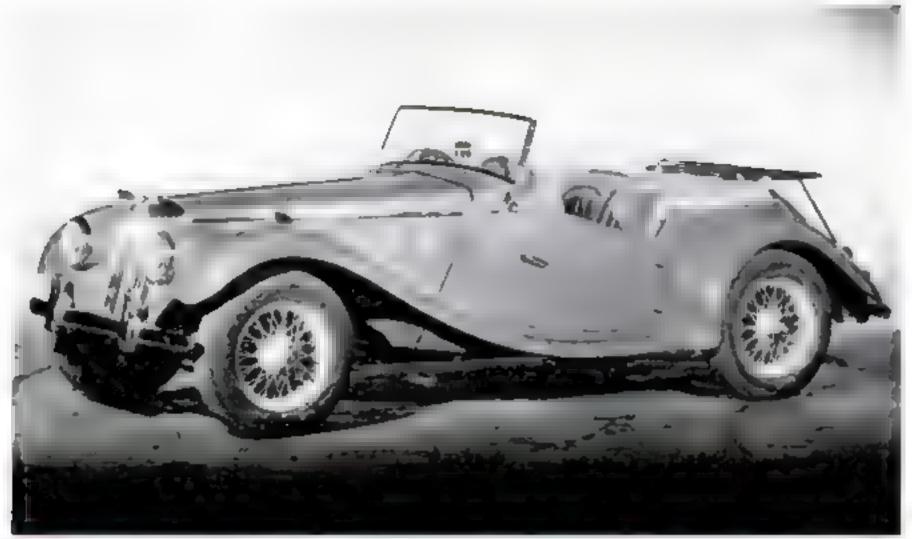
Pierce engineers, however, disagree. They argue that the device frees a driver from right-leg cramps, lets him readjust

[Continued on page 264]



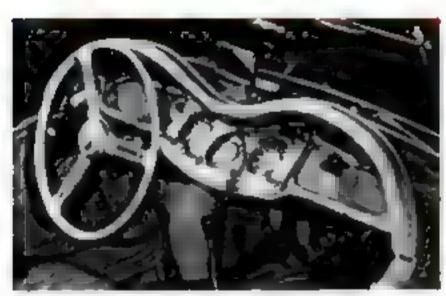
#### Pop Goes the Pilot!

ABOVE is a bird's-eve view of how a USAF pilot dismounts while his flying horse is racing at better than eight miles a minute. The ejection device pops him out seat and all—and doesn't even tip the seat. The plane's a jet trainer.



Sloping hood makes the new MG look even lower than its 481g inches to top of windshield.

### MG Slicked Up to Look Expensive



REDESIGNED COCKPIT has slanting dashboard with regrouped instruments, two open glove compartments. Seats are individual buckets.



FOUR-STATER MODIFIED-IN-U.S.A.—a special rewarking of the old TD model—now lets you take Mom and the kiddles along to the rallies-

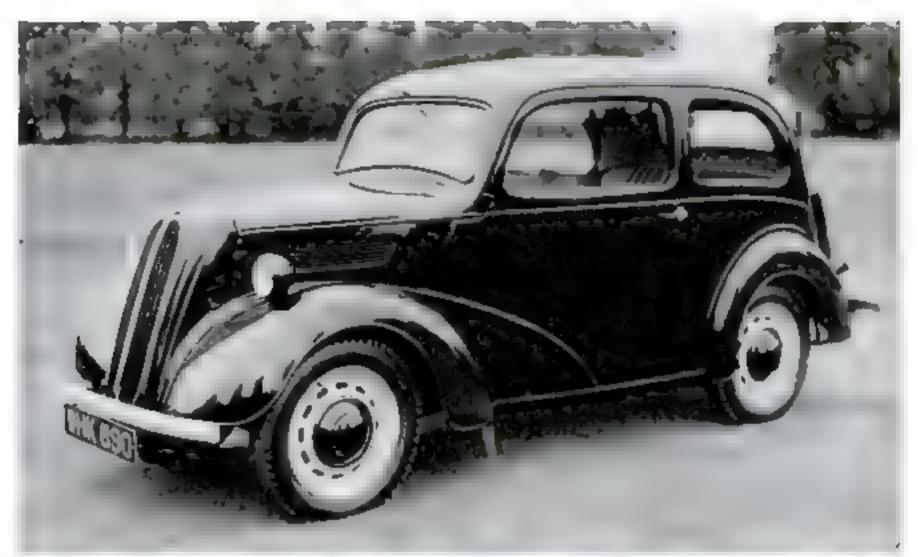
MG FANS, as fanatic a clan as you'll find in the motor world, seldom get a new model and usually look askance when they do. The racy beauty above should prove the exception. It is the TF, first change in their beloved Midget in three years and only the fifth since the T series appeared in 1936.

The big modification is mainly in looks, the company frankly admits. Gone are the squared-off radiator and archaic headlights. The hood now slopes more sharply to the radiator and the radiator itself is slanted. The headlights are faired gracefully into restyled fenders in the Italian fashion.

And the wire wheels are back to quiet the anguished cries that mourned their disappearance from the 1950 TD. On the TF they are optional extras, however.

Principal engine change is the addition of twin air cleaners, with a slight increase in horsepower to 57. Top speed is about 90.

American admirers of the MG who have wanted room for the family in this sportster can now buy a four-seat version. Not a factory job from England, it is an alteration of the 1950 TD model done in New York by the U.S. distributor, J. S. Inskip, Inc. The standard TD is lengthened 10 inches by the addition of new frame members, and a rear seat is installed.



This Ford, introduced at recent London motor show, is called "world's lowest-priced sedan."

### British Ford Stripped Down to \$770

THE word "Ford" means something different in England. For one thing, it means "the world's lowest-priced automobile," selling for \$770 in U. S. money without the British "purchase tax." British-made, it has 30 horsepower and will go up to 50 miles on one Imperial gallon, equal to 1.2 U. S. gallons. To the basic price the British add a tax of \$324.

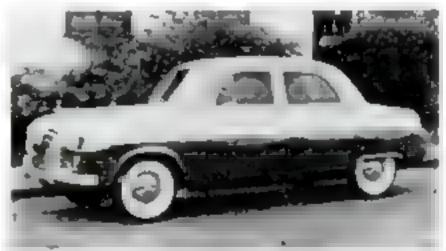
The Popular, as it is called, is one of five brands of Ford cars made in England. The others are the Anglia, Prefect, Consul and Zephyr Zodiac. Considerably higher-powered than their stablemates, the Consul and Zephyr (PSM, Sept. '53, p. 134) are made largely for export.



AUSTERE by American standards, Popular's panel contains only essential instruments.



LOOKING MUCH LIKE Ford Consul, Prefect has 36-horsepower engine, same as Anglia.



BIGGEST British Ford, Zephyr has 68 horse-power; Consul, its sister export car, has 47.



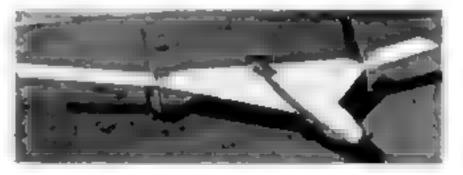
#### Biggest Helicopter Hauls 40 Men or Three Jeeps

Like the tiny French 40-and-eight boxcars of World War I fame, the Air Force's newest helicopter has room for 40 troops. But the Piasceki Transporter, the world's largest, is

134 feet long—equivalent to two U.S. boxcars. It has two engines but can fiv on one. In place of troops, it can carry 32 litters or three jeeps.

#### Flying Wing Trains Gunners

Burrisu jet pilots practice gunnery with this tow target shaped like a flying wing. The 25-foot model has a metal skin filled with plastic for greater strength and is fitted with dive brakes and a tail chute.





#### **Turboprop Sheds Its Starter**

What looks like a fuel-tank pod beneath the wing of the Navy's turboprop Skyshark is a portable engine starter designed by Douglas. Left behind at take-off, it cuts 500 pounds from a plane's weight, enough for an extra both or several more rockets.



#### Fence Deflects Jet Blast

So they wou't mow a man down with jet exhaust, planes on the Boeing flight line are being fenced in. Curved vanes on tilted steel screens, set about 100 feet to the rear of Stratojets during ground engine run-up, deflect the blast upward.

#### Hardly Anybody Noticed Last Year's

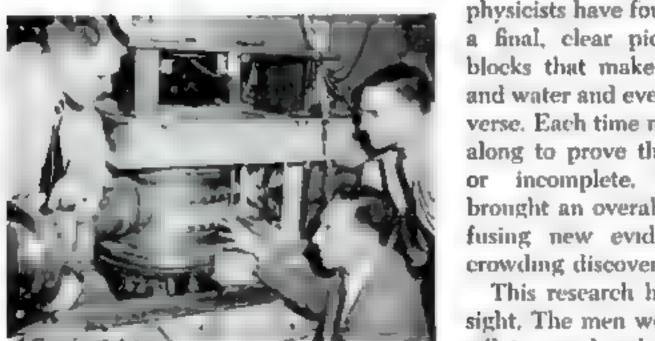
### Most Significant Science News

Discoveries in '53 may indicate long-sought answer to ultimate puzzle: What is the world made of?

#### By Martin Mann

THE hydrogen bomb—American and Russian—made the headlines last year. But it was hardly news to the physicists who had made it possible. They knew it was coming. To them the big news in 1953 was further progress in exploring and explaining what the world is made of.

This is a task that never seems to end. Many times the



A new and even
stranger picture of
the atomic core is
indicated by machine
built last year at
Stanford. By diverting
high-speed electrons
through pipe at
left against target
atoms in drum,
scientists learned
core is not uniformly
dense, but has fluffy
edges like cotton ball.

physicists have found what seemed to be a final, clear picture of the building blocks that make up people and trees and water and everything else in the universe. Each time new evidence has come along to prove that picture was wrong or incomplete. Recent years have brought an overabundance of such confusing new evidence, with discovery crowding discovery.

This research has no practical use in sight. The men working at it can bardly tell in words what they find, let alone

guess how it might cure cancer or make cars cheaper. Yet just such highfalutin curiosity in the past led directly to the very practical benefits and horrors of atomic energy.

What is the world made of? Too many things. First, it is made of molecules. Trees and people are mixtures of different molecules; water is all one kind of molecule.

#### Atoms Combine in Countless Ways

Molecules in turn are made of atoms. There are only 90odd atoms, but these are enough to make a tremendous variety of molecules. Scientists make new molecules for bug killers and textiles every day by juggling the world's small stock of atoms.

Atoms are made of . . . Well, that's where the confusion

### Here's What They Found in Atom

	NAME	WEIGHT (compared to electron)	ELECTRIC CHARGE
	electron	1	negátive
	proton	1,836	positive
	neutron	1,839	neutral
	positron	1	positive
Ĺ	antiproton (?)	1,836	negative
	neutrino	0	neutral
	gnu mesoris	212	positive or negative
_	pi mesons	276	positive or negative
_	pi neutral meson	266	neutral
	chi mesons	1,400	positive or negative
	V mesons	800-1,100	positive or negative
	kappa mesons	800-1,100	positive or negative
	tau mesans	975	positive or negative
	V particles	2,200	positive, negative or neutral
_	V <sub>s</sub> particles	972	neutral
_	S particles	1,480	positive or negative
	zeta particles	550	positive, negative or neutral
_			

comes in. Small as they are—about 1/250,000,000 inch across according to a new measurement last year—atoms are largely empty space. Spinning around most of this space are electrons, exceedingly lightweight, negatively charged particles. In the middle is the atomic core—nucleus—crammed tight with the heavy neutrons (uncharged) and protons (positively charged). The core is astoundingly compact: it

contains nearly all the atom's weight but occupies only 1/2,000,000,000,000 of the volume; it weighs 480,000,000,000,000 times as much as water.

Unfortunately, electrons, protons and neutrons are not all. More parts to the atom keep cropping up. The score now stands around 21. How do they fit into Nature's master plan? Many of them don't—vet.

One that does is the meson. The famous Japanese physicist Hideki Yukawa predicted that this building block must provide the "atomic glue" which holds the core together. Otherwise all those positively charged protons in the core would repel each other, as like electrical charges do, and tear the core apart.

Caltech's Carl Anderson soon found mesons in cosmic rays, the mysterious stream of particles which continuously showers the earth from outer space. But these mesons did not fit Yukawa's theory. Not until years later was a second type of meson suggested, and quickly discovered in high-altitude cosmic rays. They seem to solve the glue problem, but leave Anderson's mesons a mystery.

The strangest of the "extra" building blocks is the atomic ghost, the tiny neutrino. It has never been observed and probably never will be Having no charge and almost no weight, it cannot be recorded by Geiger counter or cloud

chamber. It must exist, however, to make the physicists' books balance (If it didn't exist, some reactions would violate the fundamental law against destroying matter or energy.) And plenty of indirect evidence proves the neutrino a very real ghost. The latest tests, performed at the Hanford plutonium factory, clinched the case by detecting the end products of a reaction involving a neutrino.

The meson and neutrino were discovered because the pencil-pushing theorists told their dial-twisting experimental colleagues what to look for. Other building blocks the lab men turned up on their own to add to the confusion. The particles exist all right—their tracks are seen in cloud-chamber photos, their charge and weight can be measured—but why so many for no apparent purpose?

One mathematician answered last fall: there really aren't so many; they may all be simply different forms of one truly fundamental building block. His theory, however, involves six dimensions, two more than the Theory of Relativity.

#### New Atom Machine Uses AA-Gun Parts

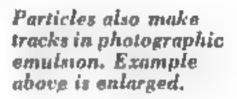
Simpler solutions may come from new experimental machines announced last year. Stanford has put a detector on a 40-mm, antiaircraft gun mount to eateh electrons bounced off atomic cores. This shows the placement of particles inside the core. First results indicate the core is not a solid ball, but cottony—dense in the middle but fluffy at the edges. At the University of California the "swindletron" promises an easier way to peer inside the atom. It gets its name from the fact that it seems to swindle Nature by shooting atomic bullets with twice the energy fed into it. And Brookhaven National Laboratory proposes another new kind of atom smasher, 10 times more powerful than its predecessors.

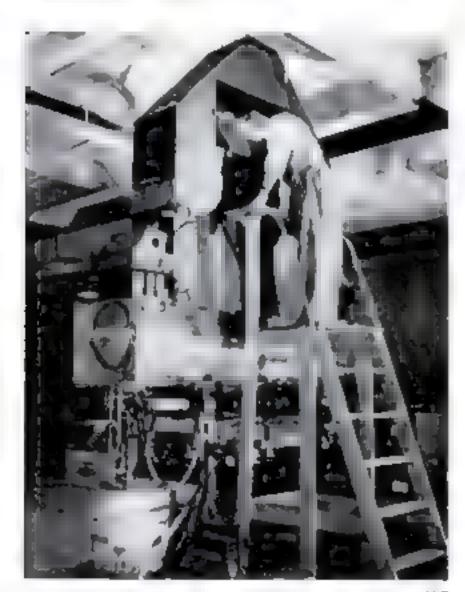
That the confusion will be ended-perhaps soon-few physicists doubt. But in the meantime the world is made of too many things.

#### All You See Is Their Tracks



Charged pieces of atom leave vapor trails as they traverse cloud chamber.





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Seven-joot-long tank (left) is cloud chamber used at Brookhaven to record vapor tracks, Instruments (below) are sent aloft to check temperature, pressure for balloon flights that bring back photo tracks like lower one above.



# PS.

### Last minute news & notes...

A MILLING MACHINE CONTROLLED BY A TAPE RECORDER will start making jet-plane parts this year. It is expected to double normal output. The control tape is recorded by running the machine through its operations manually. After that the tape need only be played back to make the machine produce the parts automatically.

RAINY WEATHER should make your car run more quietly, a Standard Oil expert told the SAE. His tests show that engines knock less on a wet. cool day with a low barometer reading . . . An acid neutralizer for crankcase oil, an aluminum-magnesium -alloy rod that fits in the drain plug, is being marketed through filling stations. The inventor. W. A. Johns of Dunellen, N.J., claims that the cylinders of one test car. examined at 125,000 miles, had been only half worm down to the first rebore. Another car, used as a control, was junked at 45,000 miles. . . . Jaguar regained the stock-car speed record when an XK-120M hit 172 for the measured mile in Belgium. . . . A new Indianapolis Speedway mark for stock cars was set by a '54 Chrysler that averaged 89.76 miles per hour during a 24hour continuous run. On the straightaway it topped 120.

HIGH-FIDELITY PHONOGRAPHS, once limited to an exclusive fraternity of enthusiasts, are close to becoming standard home appliances. One indication is the skyrocketing sales of \$15-and-up diamond needles. Hifi fans are practically the only customers. One company reports a 400-percent jump for part of 1953.

BIGGEST SCIENCE HOAX is bared by discovery that "Piltdown Man" is a fake. Chemical tests, British experts report, prove that jawbone and teeth of an ape were doctored

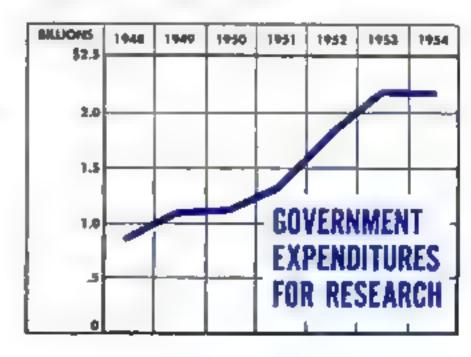
with stains and file to pass for human relics 500,000 years old-then "found" in a Sussex gravel pit by an amateur geologist in 1911-13. Exposure of fraud is relief to savants, long puzzled by discrepancies with other finds. (Next month Popular Science Monthly will carry the story of an authentic discovery, a missing-link ape man.)

PILOT DOUBLES SPEED OF SOUND. A speed of 1,327 m.p.h. was reached recently by NACA pilot Scott Crossfield in the Douglas D-558-II Skyrocket research plane. At the 60,000-foot altitude, his speed was 2.01 that of sound.

ATOMIC ENERGY WILL HEAT SOME NEW BUILDINGS at the Hanford plutonium factory. The heat, enough to warm 1,000 average homes, will be extracted from water that cools an atomic furnace and transferred to the air going through the plant air-conditioning system.

FUME-LADEN CITY AIR is blamed for lung cancer by Dr. Paul Kotin of the University of Southern California. He found chemicals that cause mouse cancer in the exhausts from gasoline and diesel engines. Improperly adjusted or slow-running engines are the worst offenders, he says, and suggests that speeding up traffic might reduce lung-cancer deaths.

LESS TAX MONEY will be spent on research this year, the National Science Foundation reports (see chart), with still less scheduled to be spent in following years. The only exception is agricultural research, which will get increased allotments. Defense, however, still takes the lion's share, about threefourths of the total.



# Answers to Questions

## TV's 70 New Channels

New programs and new problems are both on schedule as UHF zooms television's air space.

#### By Robert Hertzberg

Out of range of present TV stations? Or sore because there aren't more programs to choose among? Many of us fall into one group or the other—and in either case we're getting a break. More TV is on the way. Seventy new frequency channels have become available—nearly six times as many as there used to be.

Where does the new air space come from? Ultrahigh-frequency TV broadcasting (PSM, Aug. '50, p. 111) has graduated from experiment to reality. The new channels are in the frequency spectrum between 470 and 890 megacy cles—well away from the dozen overworked very-high-frequency channels.

It will be a long time, the Federal Communications Commission believes, before all 70 of the new UHF channels are used up. In the meantime they will bring TV to new millions. They will also bring some new problems. For to make the most of what UHF has to offer you must know two things

How to adapt your receiver to it.

How to tune it with the correct antenna.

The first of these is easy; the second, not so simple. Both are covered in detail in an easy-to-follow quiz starting on the next page.



#### that a UHF receiver needs roper antenna. Is there one kind of antenna TV?

. The bow-tie antenna, used flector screen as shown at jular. Then there's the corner are V or fan, and the rhombic.

#### How do you use all these different kinds of UHF antennas?

Well, for people in the primary service zone, a bow-tie antenna with a flat reflector screen should do the trick. At somewhat greater distances, you may need an antenna with more "gain," one that extracts a stronger signal from the passing waves. The corner reflector, the V and the rhombic are next in popularity after the bow tie. All four of these antennas respond well to the whole UHF band, and are therefore called "broad band." For still more gain in weak signal areas, you can stack them-that is, put two or more one above the other or side by side. Most stacked antennas contain two or four elements, which are joined together with tie wires to act as a single antenna.

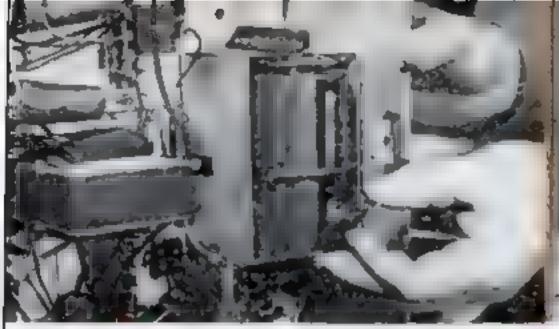
For the maximum effectiveness on only one channel or a group of adjacent channels, the yagi is extensively used in fringe areas. (Its name comes from its inventor, not its shape. It looks like a fishbone.)

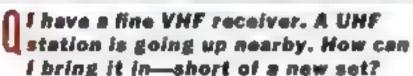
### How can I tell if I'm in the primary service area or in a weak signal area, so that I can pick a specific antenna to suit?

An advance. You can find out only by installing one antenna and checking your results. If you get good pictures right away, you're in luck. If you don't, be prepared to experiment either with the first antenna or one of a more advanced type. An excellent and untapped source of advice in this connection is the local UHF station that you are trying to receive. Its management is anxious to build up an audience, and is happy to pass along helpful hints and suggestions based on engineering field tests and observations.

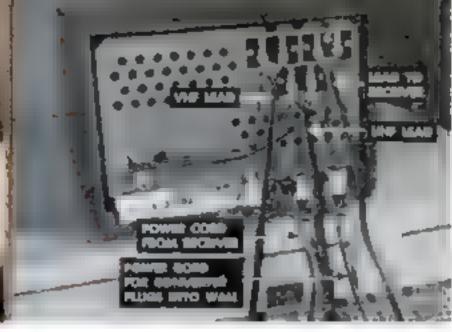


TE POPULAR SCIENCE





Alf your set is not too old, have a service dealer replace unused VHF tuning units in the channel-selector turret with new UHF "strips," as shown above: Each strip will be the correct frequency for one UHF station. This may mean expensive digging in the chassis guts. "Strip" conversion is okay if you are in a strong signal area—say within 10 miles. You can also use a converter.



How about using one of these sepa-

A separate all-channel UHF converter connected to your VHF receiver costs quite a bit but brings in a stronger signal than a strip conversion. The converter contains two or three small tubes to boost UHF signals. You can connect it in five minutes—and change from UHF to VHF and back at the flip of a switch. The same brightness and sound controls are used for both.

# We've had no TV but now a new UHF station will open here soon. What kind of TV set should I buy?

A tor UHF. Full coverage of the 70 UHF and 12 VHF channels is a feature of practically all makes for 1954.

# Why do manufacturers provide for 82 channels when only a few are likely to be used in any one area?

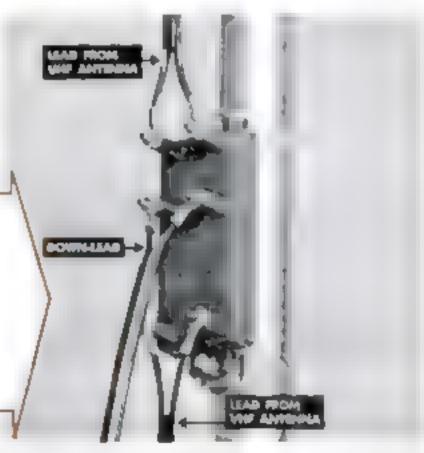
A "All-channel" tuning is a potent sales factor. Suppose you move six months from now to a city where the broadcasts are on different channels? Anyway, with one of the new tuning heads it's actually easier and cheaper to include full coverage than partial.

A neighbor put both UHF and VHF
antennas on one mast but he had to
buy a couple of "Isolating
filters." What are these for?

These devices keep the two kinds of signals from getting mixed together.

# Well, suppose I already have a VHF receiver to which I'll add a UHF converter. Can I convert the VHF entenna as well, to save the cost of a new one?

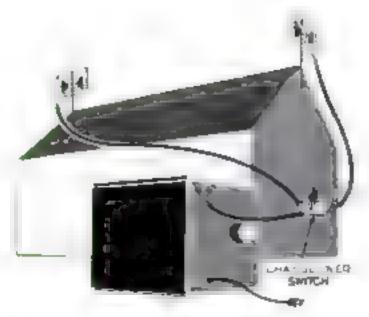
A No, but there's no harm in at least trying the VHF antenna for UHF. In a strong signal area you may be pleasantly surprised by perfectly good pictures. If the stunt doesn't work, you'll need a UHF antenna.





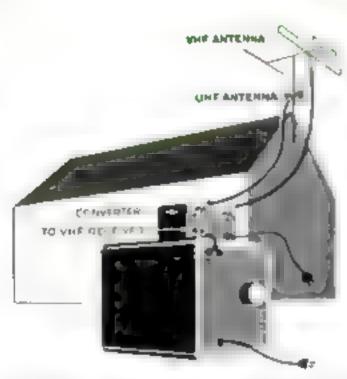
There will be one UHF station in my area and no VHF. What's my antenna?

One fixed antenna of the various types we discussed earlier is all you need. Orient it toward the station. Be sure it is tightly fastened, that there are no flapping elements, and that the down-lead doesn't swing much —otherwise your pictures will flutter when the wind blows.



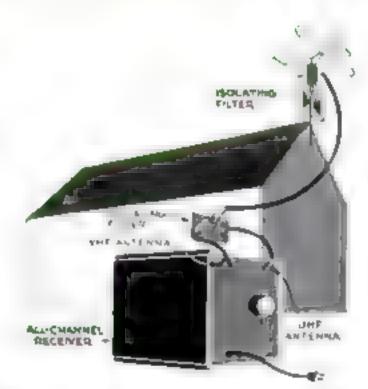
Suppose another UHF station is built later, in a different direction—what do I do then?

Use two antennas and orient each one to one of the stations. Bring the separate leads into the house, and at the receiver position choose between them with a small change-over switch. This is the cheapest method when you have only two channels.



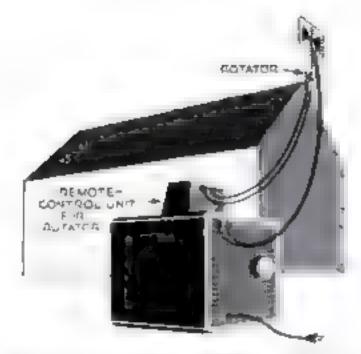
I already have a VHF receiver and now a UHF station is coming. Can I put the UHF antenna on my VHF antenna pole?

A Yes, try it. If it doesn't work, shift the UHF to another location. If you do use the same pole and your present VHF reception is satisfactory, leave the antenna alone. For the UHF antenna, run a separate downlead of the new tubular kind, not the VHF flat-ribbon type. Connect the VHF and UHF leads to the marked terminals on the back of your converter or all-range set. If you use a converter, connect its output terminals to the antenna terminals of the VHF receiver. A switch makes the proper connections.



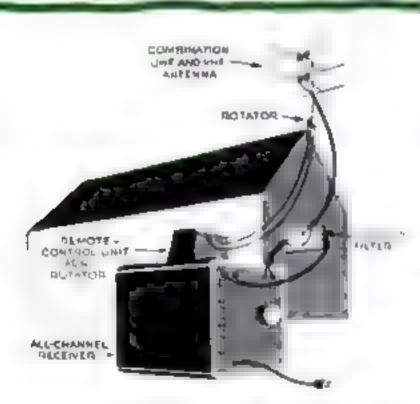
What about those isolating filters you were talking about a while back, for this kind of job?

A of antenna on the same mast. Replace the old VHF ribbon with a new length of tubular down-lead and use this one cable for both VHF and UHF. Then use one isolating filter on the mast and another at the converter. They have no controls and require no adjustments. Screw terminals enable you to install them quickly, either with a converter or an all-range receiver. Incidentally, you'll find one of the most important considerations in placing the antenna is to get it where it chminates bothersome ghosts.



# We expect several UHF stations in different directions. What do we do?

A For more than two stations, it's cheaper to have a motor-driven rotator on your antenna. Remotely controlled from the receiver position, this enables you to swing the antenna accurately to any station for maximum signals. Average price is \$29. You can install it yourself.



I live in a city that has both UHF and VHF stations scattered in the surrounding hills. I intend to buy a new all-channel receiver. What's the antenna for my needs?

A combination job. In its usual form it consists of a bow-tie UHF element sitting in the center of a modified V, fan, or conical VHF element, with suitable reflectors. Two such antennas, stacked vertically, provide very high gain and directivity. A rotator is a "must," as the UHF and VHF signals will be arriving from several directions. And you'll find the rotator helps kill ghosts by enabling you to lose a weak reflection from one side without losing the main signal.

# Can I do all this antenna work we've been talking about, myself?

A sure. UHF antennas are much smaller than the VHF type that thousands of people have installed themselves. But you'll need help in orienting the antenna. While you're up at the mast or on the roof turning the aerial, have a friend at the receiver reporting on the picture. Don't be discouraged if the first antenna location doesn't work. Try others, wherever you can get a foothold. The highest point of the house isn't always the best. UHF waves bounce around pecuharly and you may pick up a favorable reflection at such an unlikely spot as a ground-floor window.

# I am using an indoor antenna for VHF, and getting good results. Can I use a similar antenna for UHF?

A indoor antennas for UHF haven't been too successful—but you can try it.

# Can window-type antennas be used for UHF?

A Vgam, you can tell only by trying. They're usually more effective than indoor ones.

# How close must I be to a UHF station to get satisfactory pictures?

A 10-to-15-mile radius in flat terrain. Acceptable pictures are received up to 30 or 10 miles. Freak reception can be expected nometimes in some places much more distant. These distances are a good deal smaller than with VHF. For one thing, UHF stations are not using as much power yet. Also, UHF waves are sharper than VHF and do not seem to fall in around obstructions in their path to the receiver, which makes the antenna position very important. UHF transmission seems to be better at night than during the day, and in hot, humid climates than in cold, dry areas.

# I had a lot of trouble getting rid of ghosts on my VHF set. Will the same problem arise on UHF?

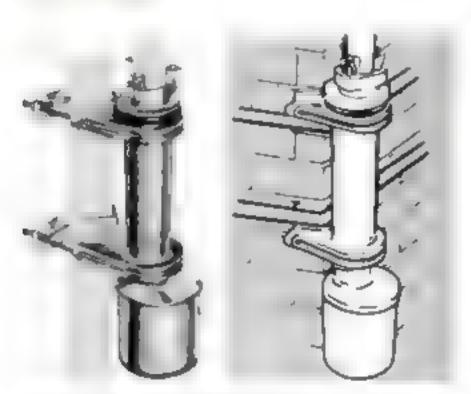
A Probably—and it may be even worse because the ultrahigh frequencies are more readily reflected.

During and after a rain, my neighbor's UHF receiver seems to lose its pep. At times the pictures just gradually disappear. When the air dries, they are fine again. What does this?

A Probably a short circuit across the terminals. This can result from water accumulating on a solid insulating block holding the terminals. This trouble was widespread in Portland, Ore., about a year ago when one of the first UHF stations went into operation there. Most newer antennas have free-space terminals and are not vulnerable at this point. Water seeping into a hollow downlead that is improperly sealed can also cause signal loss.

# Will I be able to receive color on a UHF receiver?

On a color UHF receiver, yes—if color programs are being transmitted by your UHF station.



#### Remote-Control Antenna Locks

HANDY for VHF TV, a remote-control antenna is pretty essential when UHF stations start popping up around the horizon. The new Superotor is said to tune to half a degree and stay there—thanks to a worm gear that locks the shaft against drift while a brake keeps the motor from coasting. The motor can be quickly detached from the base as a unit, for servicing. As shown above, the Superotor's mount can be used with a stub mast or fastened directly to a chimney, with the drive unit below the crown away from corrosive smoke. Leader Electronics of 2925 E. 55th St., Cleveland 27, makes the antenna.

# On my VHF receiver I am troubled frequently by interference from automobiles. Will I have this on UHF too?

A Probably not. Most of the interference created by sparking electrical contacts seems to be lower in frequency than UHF signals. In some areas saturated with random interference from heavy machinery, UHF delivers clear, sharp pictures where VHF produces only badly smeared ones.

# How many UHF stations are on the air?

As of November 1, 1953, there were actually 94 stations in operation. The FCC has issued construction permits for 180 more. Check your local newspaper for news of a forthcoming station in your area.

Build your own converter to get new UHF stations in addition to regular channels on your present set. A unit you can make without special instruments will be described in Popular Science Monthly next month.



#### Knob Tunes Both Antenna Arms

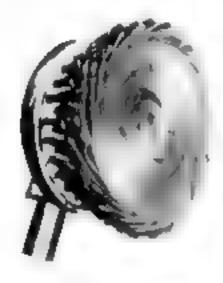
You just twiddle a knob to tune the twin telescopic arms of the indoor antenna above. The result, says the maker, is a continuous tuned circuit that produces the maximum signal output from each channel—and less mismatch and fewer fuzzy pictures. The base is weighted to make the unit difficult to tip over. The device is made by Radio Merchandise Sales of 2016 Bronxdale Avenue, NYC.

▶▶▶A neutral-tinted safety glass reduces brightness haze and makes sharper pictures on a new TV screen, reports Libby-Owens-Ford. Unwanted light peaks are neutralized.

# Winter Aids from Auto Row

1. Tow Chain Hooks on Bumper. It's seldom that a push will help a car that's really stuck in deep snow or ice. This 10-foot tow chain has two hooks on each end that catch the top and bottom edges of the bumper of the tow car and the car being towed. Tension on the chain keeps the hooks engaged. The chain is packed in a red bag that can be used as a distress signal.





2. Rotating Brush. Save your hands from frostbite with this auto-washing brush. Water power spins the inner brush at 1,500 r.p.m. to remove slush, mud and icemelting chemicals. A four-foot handle attaches to garden hose.





flexible separators (shown in photo) that outlast the wooden ones often used. Cells are said to recharge themselves in one minute, without help from the generator, after being completely run down by cranking a stubborn, cold engine. It can be had for six- or 12-volt systems.

Further information on these items can be obtained from: 1. S. G. Taylor Chain Co., Hammond, Ind. ; J. Henrie L. Miller Co., Manti, Bink; J. Continental Mig. Corp., 10107 S est Washington Blod., Culver City, Calif.; 4. Almin Products, Minaukee, S. i.; 5. Dorothy Damar, 900 Damar Bidg., Newark, N.J.

ands from with this g brush. The spins the at 1,500 remove and ice-emicals. A sandle at-orden hose.

4. Three-Way Brush. Here's a tool that will brush snow off your car, scrape sleet off the outside of the windshield and squeegee fog off the inside. The scraper is detachable so that you can also use the brush for sweeping out your car's interior.

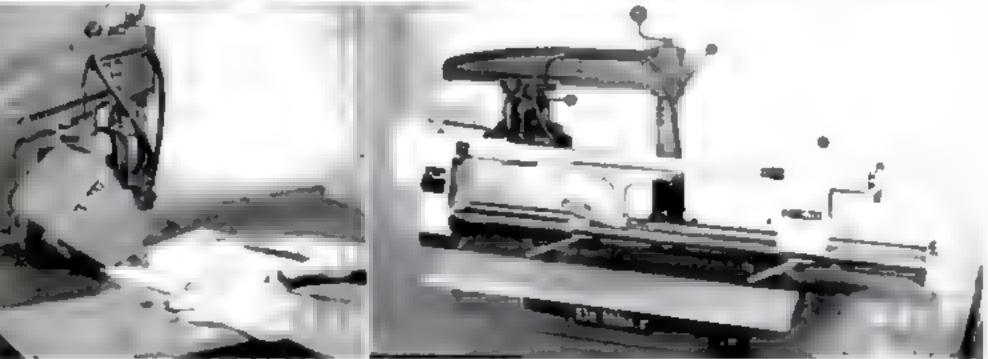
5. Gun Gets You Moving on Ice. Pumped by hand like an insect sprayer, this gun shoots a spray of ice-melting crystals that help get your car on its way. The crystals stay put, providing traction as they soften the ice. The gun, called Traxion, has a 10-inch cylinder that is said to contain a full season's supply of crystals.



JANUARY 1954 [5]



1. S-in-1 Shop Tool. A single motor on a sliding mount powers five separate tools in this combinution shop. In vertical position (at left) the motor serves as drill press, and in horizontal position as sander and headstock for a lathe. A table saw and jointer (in foreground) are arranged in front of the lathe so they can be beltdriven by simply sliding the motor along the lathe bed. All five tools fit in a 3'-square work space.

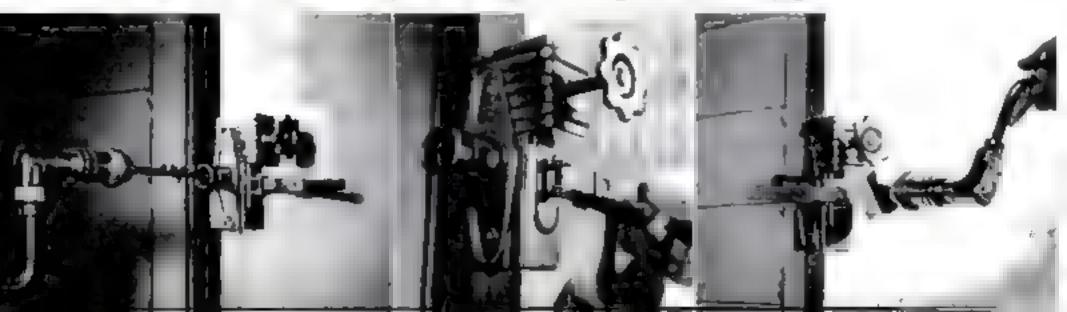


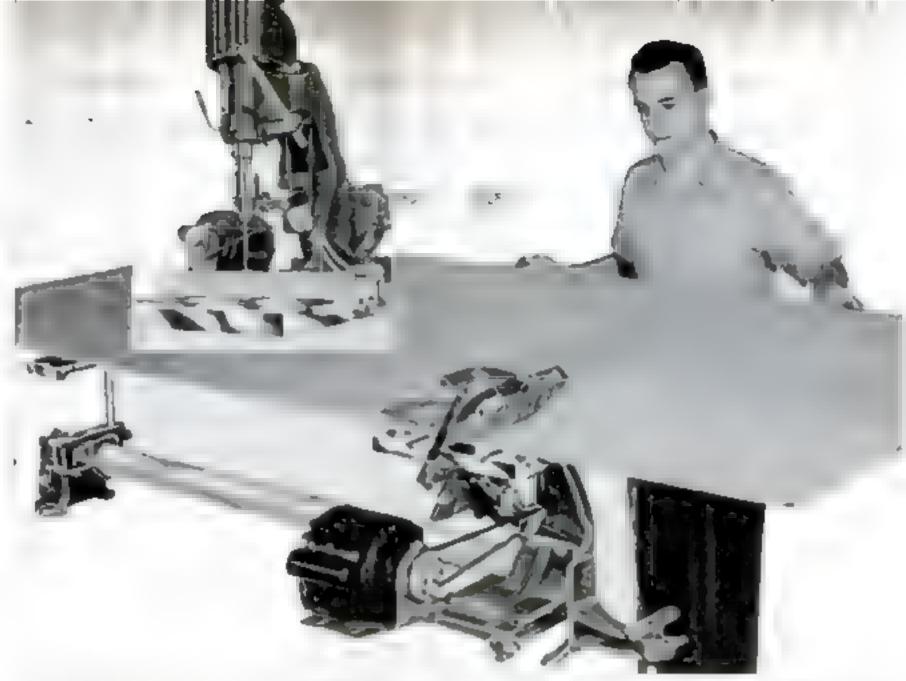
2. Radial Arm Holds Saber Saw, Lathe. Two new attachments for this radial-arm saw are a suber saw, shown at left above, and a lathe, at right. The lathe, clamped to the saw table and belt-driven by the motor, will take stock up to 12" in diameter and 37"

3. Jig Speeds Lock-Setting. The compheated task of installing a door lock can be done in only 15 minutes with this jig. The jig is first clamped to the door and the drill inserted in the barrel (left, below),

long. It can also be used as a separate tool with its own motor. The suber-saw attachment mounts directly on the radial-arm motor, and can be tilted up to 45° to either the right or left. The saw will cut stock up to 2" thick.

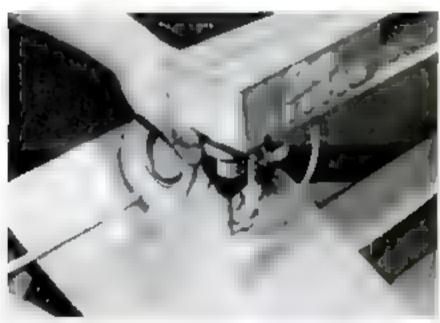
which guides the bit for boring the end hole. A sliding pointer is then set to the correct lock size and pressed into the door (center), quickly marking the point for drilling the side hole (right).



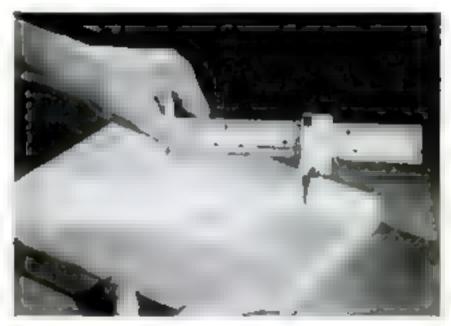


4. Multipurpose Tool Has Tilt Arbor. A trick suspension on this new low-cost combination shop tool provides a fully tilting arbor for sawing, sanding, grinding and polishing. The motor remains horizontal, but rides on a sliding carriage (above) that

moves sideways as the arbor cradle is tilted, always keeping the belt in line and minimizing wear. With the drill-press headstock in place (inset), the tool will also do wood turning, metal spinning, and vertical or horizontal drilling.



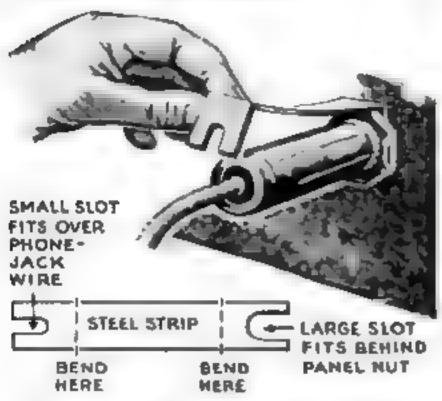
5. Jigsaw Has Built-In Motor. You don't have to set up any belts or pulleys to drive this jigsaw—it has its own rotary motor built right into, the base. The saw has a 20" throat and will cut up to 2" stock. A tilting table and combination rip fence and miter gauge permit ripping, crosscutting and making compound miters.



6. Compass Does Four Jobs. This inexpensive plastic drawing tool has a ruler on one edge and a protractor on the other. As a compass, it scribes circles up to 17" in diameter and, with a stylus in place of the pencil, will mark metal and plastic. With the pencil holder removed, it serves as a small T square.

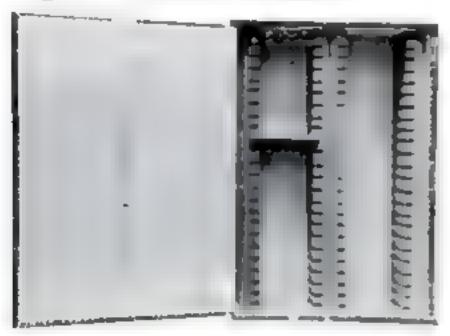
Further information on these products can be obtained from: 1. Heston & Anderson, 626 Kirkwood Ave., Fulcfield, Iowa; 2. DeWalt Inc., 3046 Fountain Ave., Lancators, Pa.; 3. Schlage Lock Co., Borshore & Blanken Ave., San Francisco, 4. Plana Centric Pages Tool Co., 20 Barlston St., Boston 16; 5, Skapmaner, Inc., 1214 So. Third St., Minneapolis, Minn. 7. 6. Ambi Corp., Box 39, Fhitestone 57, N. T.

#### Jack Is Locked in Place

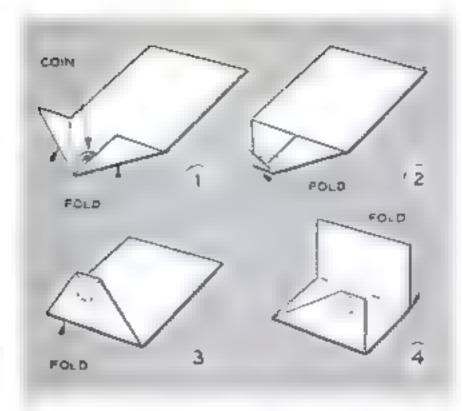


If a phone jack pulls from its receptacle when given an unexpected tug, make a locking clamp from a strip of spring steel about %" wide. Cut U-shaped notches in each end of the strip, bend as shown and slip one end behind the receptacle nut. When the jack is plugged in or removed, lift the end of the clamp to allow the body to pass.—Phil McCafferty, Fort Bliss, Tex.

#### Cigar Box Stores Slides



Four strips of seasoned hardwood with evenly spaced slots cut in their facing edges turn an old eigar box into a handy slide box for 35 mm. transparencies. Twenty-five parallel slots are made in a single block of wood-a bench saw will cut them wide enough to receive cardboard mounts-and the block is then passed through the saw lengthwise to provide four matching strips. Clue or nail the strips in place, attach a table of contents to the lid, and you have a trim container which serves as well as the most expensive commercial slide box.—W. A. Campbell, Athens, Ga.

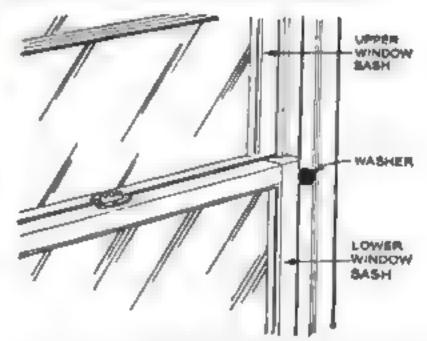


#### Letter Serves as Coin Mailer

Follows the bottom of a sheet of letter paper, as shown in the accompanying sketches, makes it a handy coin mailer. It will keep the coin in one place, near the center of the letter, and insure it against loss when the letter is opened.—E. R. Scager, Long Branch, N. J.

▶▶▶Instead of spending time cleaning a paintbrush that you'll use next day, wrap it well in aluminum foil. This will keep it moist overnight.

#### **How to Stop Window Rattle**



A window sash that chatters in its casing can be quieted by slipping two faucet washers over wood screws large enough to act as snug axles. Then drive the wood screws into the window frame at points where the washers press firmly outward against the side members of the lower sash. Pressing the two sashes together stops the rattle, and the rotating action of the washers lets you raise and lower the windows easily.—Howard E. Moody, Upper Jay, N. Y.



## Filament Tape

Strands of rayon or glass pher embedded in the adhesive backing make the strongest tape in the world. Only 1/100 inch thick, a piece an inch wide has a tensile strength of 180 lb. (rayon) or 500 lb. (glass fiber).

# 3 Dozen Ways to Use Tape

Projects and repairs are easier with tape to lend a hand. Use it in place of glue, paint or rope.

#### By Darrell Huff

IT'S an impressive sight—one car yanking another up a hill with nothing connecting them but a slim line of white tape an inch wide and scarcely thicker than paper.

But don't doubt your eyes. The sticky topes that manufacturers call "pressure sensitive" are remarkable things today. That's why they can perform many useful tricks around your home, shop and car.

Each particular tape was made with a special purpose in mind, but each can do a variety of jobs—many overlapping into the duties of other tapes. Some were made for strength, others for beauty. But the strong one may have just the right texture for your particular job, while the pretty ones often have all the strength you'll need for other jobs (except towing cars, of course). Each has a place in your shop.



Probelievable tow chain, made from strips of filament tape, banks stalled car home. Tape is resilient enough to take shock of sudden strain without snapping.



2 Spanish windless, made by wrapping tape around chair legs, makes handy clamp for gluing loose rung. Tape is tightened by twisting with short stick.



3 Broken tool hundle will see lots more service if wrapped with this tough non-tearing tape, provided break is long one that overlaps.

## Cellophane

Usually called Scotch Tape, a roll of this type can be found in almost every home. It comes clear and transparent, or in many bright colors. If ith it you can repair almost any small household article that might get broken. Its transparent quality makes it a smudgeproof covering for all sorts of inked or penciled labels.



Mark fence settings with %" cellophane tape when making repeat cuts of different widths, Strips of different colors can be used to key the settings. Tape is so thin and hugs table surface so tightly that fence slides over it.



5 Apply it as decorative striping in a fraction of the time it would take to paint on stripes. Above, water line of toy sailboat is marked with tape of contrasting color, Coat of varnish over tape makes application permanent.

## **Plastic** Electrical

This black tape, made for electrical purposes, is waterproof and has high insulating qualities. It takes the place of both rubber and friction tape, It also makes a waterproof patch on overshoes and is a durable wrapping for golf-club or tennisracket handles.



Insulate handles of pliers to make them shockproof by wrapping with electricul tape until all metal is covered Use it on screwdrivers, too.



ing if plastic tape is used. Water doesn't soften it or make it give up its grap.



Numerous ear uses make it a must in your tool kit. Use it to waterproof wiring, repair frayed insulation or patch a cracked distributor cap.

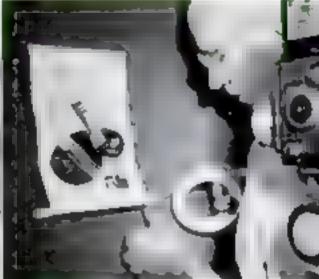
## **Double-Coated**

This is tape with adhesive on both sides. It comes in two types: paper and transparent cellophane. Aside from such obvious uses as mounting enapshots, you'll find it very useful to sandwich together sheets of plywood for multiple sawing or to fasten on a pattern.



4 Photo enlargements can be made without an easel and with no margins. Tape holds the paper Hat.

5 Felt is attached to base of lamp to base of lamp with this reliable tape, it sticks to almost any surface. Rough sur-face of felt, slick surface of lamp prove it.



16 Wall becomes copy easel with two sided tape to hold picture or page in place invisibly. Thumbtacks, pins or clips are not needed here.

## **Photographic**

Absolutely opaque and flexible, this tape was made for the darkroom. Use it to fasten negatives to printing frames, for masking or for repoiring hinged flaps on film holders.



6 Leaky camera bellows needs a hight-tight, flexible, hard-sticking tape. Photographic tape fells the bill. Here it replaces unsatisfactory repair job that had been made with white adhesive tape.



7 Making darkroom really dark, photographic tape is used to seal light-leaking cracks where wall meets colling. Use it, too, for binding edges of glass satelight filters.



11 keep out the weather by scaling the glass with this waterproof tape. Use it on storm sish or your ear windshield, its black color makes it meonspicuetts.



12 Patch pipe that is until inlar pressure is ich as this kitchen-sink trap. It beats ordinary tape (to say nothing of chewing gain) for a lasting repair



13 Primary job is electrical work it wrips with a the bulk-a desirable feature when working in well-falled junction or switch box s.

### Plastic-Film

Tough, flexible and much thunner than the black plastic tape used for electrical work, this tape is made ¼" to 4" wide and comes in many bright colors. It will do most jobs that other tapes can do and do them better, but because of its exceptional flexibility, it is best suited for irregular shapes.



17 Inflatable plastic toys are best repaired with plastic-film tape. Its thunness, flexibility and bright colors make it ideal for such jobs, as well as decorative uses, adding stripes to boats, metal awnings or sporting goods.



18 4s floor marker, it keeps car 10 in its allotted space, guides voir wife down the driveway and marks off shuffleboard or badminton court on basement floor

### Metal

Two types are available: aluminum-foil and lead. The first is for use with aluminum in other forms. It is the notural realing agent to use with aluminum-fail insulation; it forms an excellent moisturevapor barrier. Lend tape is bearier and very moldable. Yau can shape it to fit almost anything. It, too, is a mousture seal.



19 Aluminum flash-ing is made watertight with aluminum-foil tape. Tape 1" width.

liron pipe pass-**2**Umg through sheet alummum is patural joint-scahng job for lead tape, its mertness makes it destrable for dissimilar metals.

Decorative uses for Lead tape will be of interest to the craftsman. Here it is being used to simulate inetal strapping on blond finished box.

## Masking

Every shop needs masking tape, Its big jub, of course, is to produce a clean edge when pointing, Two strips spaced side by side let you paint a clean, crisp stripe. its color is tan and it is fairly heavy, making it an ideal cushion when attacking chrome pipe or parts with a pipe wrench.



Any auto-painting job calls for masking Loo, for making a clean division between two colors. Bring it in the house for many twotone paint jobs that come up, it'll give your work a professional look.



Oc Use it on moving ∠ Duay to hold drawers shut or cubinet doors closed. Bind a protective cushion of newspaper around fragile china or expensive bric-a-brac.



invisible weather seal. 30 made with white cloth tape, blends perfectly with white woodwork around window It keeps drafts out without affecting appearance of window.



31 Add contrasting edge to shelves in seconds without painting Cloth tape sticks tight -has soft sheen.



32 Hinge and decorate a portfolio with it. Tape is strong, yet flexible enough to bend repeatedly without cracking or tearing.



22 Reflective insulation goes to to a tight spot—aluminum-foil tape completes the seal effectively.



23 Joint in aluminum pipe is scaled and remforced with aluminum-fold tape. Appearance of husbed job is neat—all aluminum.

## Carpenter's

Here's a new one, It looks like narrow masking tope, but has practically no stretch. Printed on it, on 16" centers, are cross-hatched areas the thickness of a two-by-four. The big idea is to speed up home carpentry, especially framing.



24 Laid along will, carpenter's tape indicates spacing of study and ratters. You can use it for finishing an attic or recreation room.



27 Multiple Jigsawing of wood, plywood, nardboard or plastics can be done without nating if you bind the pieces together with masking tape. Cut the tape if you must.

28 Plywood won't splinter when sawing it if you first run masking tape over the area to be cut.

### Cloth

Self-sticking cloth tape is made in just about every color and width you'd care to name. Use it to make things, mend things or to save pointing. Cut initials out of it with razor blade and stick them on luggage or glass tumblers; they'll stay put.



29 Lamp shade is bound to wire frame and finished off at same time Cloth tape in contrasting color does the job.



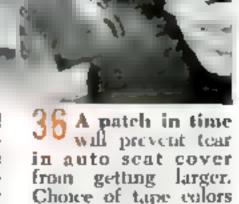
33 Add gay stripes to stool using strips of tape in alternating contrasting colors. You can't beat this easy method of refinishing a scuffed or marred surface.



34 Restore tattered book bandings with tape of matching color. Titles can be added with colored tak



35 Cover soiled tapes on Venetian blands or make them blend with color scheme of room by sticking cloth tape over them,



makes it easy to match

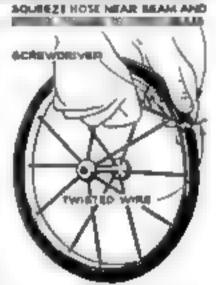
patch to cover.

#### **Tricycle Rolls on Hose**



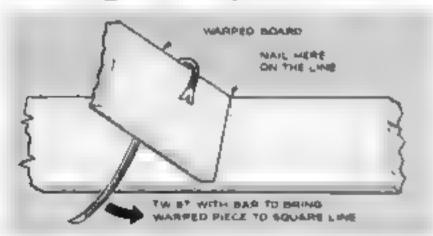
IF Your kid's tricycle is out of action with a missing tire, you can replace it with a makeshift but serviceable tread

Cut a piece of garden hose to fit tightly around the wheel. Push a heavy wire through the hose, leaving a few inches



exposed at each end. Now fit the tube around the wheel and twist the wires together until the ends of the hose are drawn tightly against each other. Snip off all but an inch of the twisted wire and force it into the joint where the hose ends meet. Grooved rubber hose makes the best tread.—John Bombardt, Los Alamos, N. M.

#### Working the Warp out of Wood

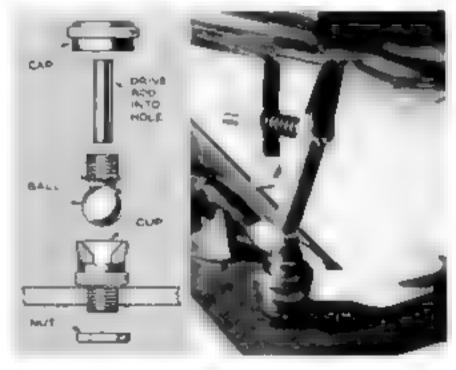


Luster that is badly warped can often be straightened with a wrecking or pinch bar. Nail one end in place as you would an unwarped board. Then with the claw of the bar hooked over the edge of the stock near its other end, lever it straight and hold it there while you nail it in place.—Howard E. Moody, Upper Jay, N. Y.



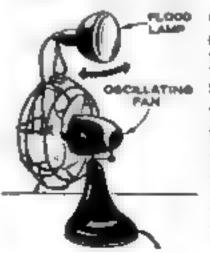
#### **Light Clamps on Clip Board**

A CHEAP laboratory clamp and a swivel connector of the kind used in wiring lamps will adapt a clip board for use in dark places. Drill a %" hole in a corner of the board and mount the connector in it with a nut. Then drive a tight-fitting bit of rod into the cord hole in the ball member, slip on the retaining cap, and solder the clamp to the rod. Clamp a two-cell flashlight between the jaws.—Floyd McGuckin, Ridgewood, N. J.



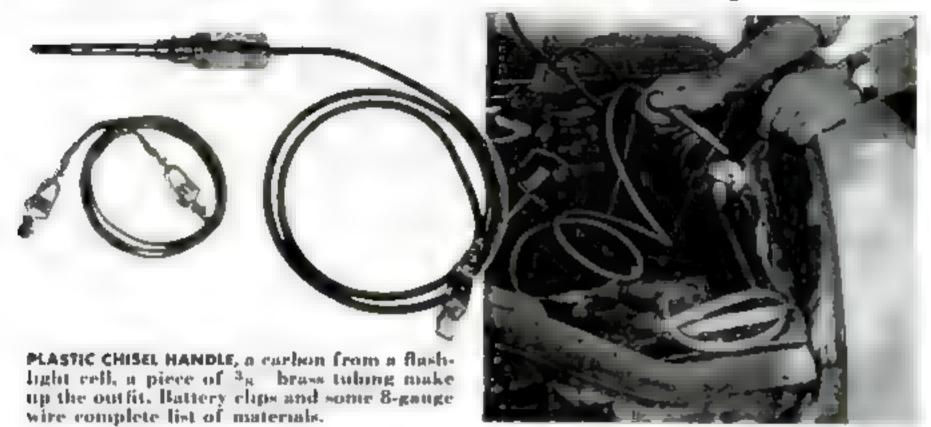
#### Fan Spreads Floodlight Evenly

IMPOSSIBLE to spread well-balanced lighting over a large picture area with a single floodlight? Not if you clamp the lamp to an oscillating electric fan. Point the lamp over the back of the fan to prevent a disturbing breeze. Then make a time exposure a



couple of seconds will do-while the flood lamp sweeps the scene. Pleasingly soft shadows result from this simple trick which makes one lamp do the work of two.— Hugh Lineback, Stillwater, Okla.

#### Soldering Iron Works Off Your Automobile Battery



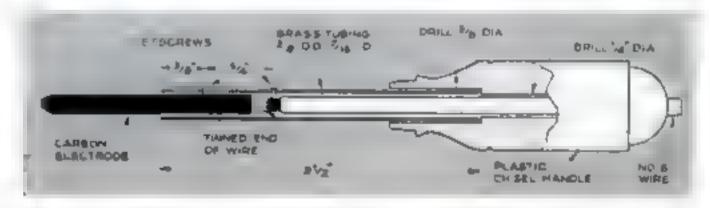
MANY a loose connection in a car has stayed loose because it was just too much trouble to drag out an extension cord, hook up the soldering iron and wait for it to heat. This outfit stays with the car because it's made to work off the car battery, and it heats instantly.

Drill a %" hole part way through the plastic handle for the brass tube. Finish the hole with a %" drill for the wire. Strip the insulation from the ends of a length of 8-gauge stranded wire. Tin one end, push it through the tubing and lock it with a setscrew. Clean the carbon electrode and file a bevel on the tip. Push it into the tubing snug up against the wire and secure it with a setscrew turned down slightly. At-

tach a battery clip to the other end of the wire. Make a ground cable from braided strapping or No. 8 wire. Attach clips to both ends.

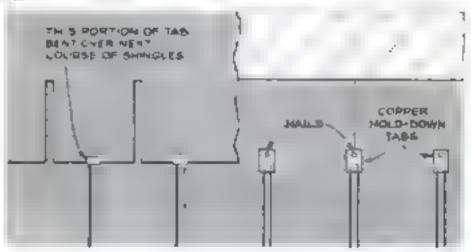
To use the outfit, clip the solderingiron wire to the hot side of the battery and
ground the part to be soldered to the
frame or motor block. It is not necessary to
disconnect the battery from the car. Touch
the carbon to the work and draw it away
slightly to create a small arc. Apply flux and
solder to the work and hold the carbon in
position until the solder begins to flow.
Don't solder within six inches of the battery as the gas generated in the cells is
highly explosive.—Pvt. P. E. McCafferty,
Fort Bliss, Tex.

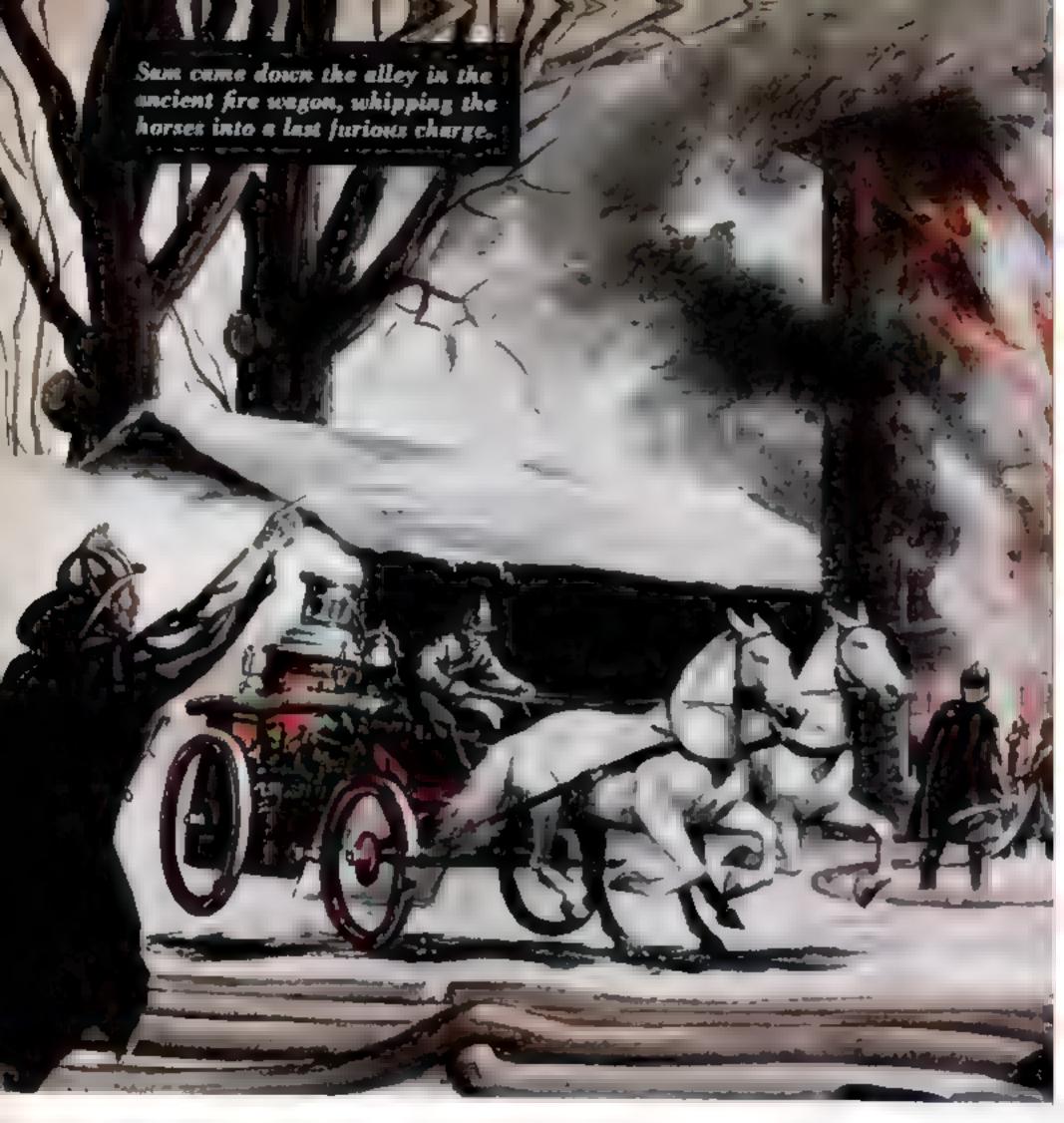
INSTANT HEAT is generated by touching earbon electrode against work grounded to frame or motor block of car. Iron draws no more current than cigarette lighter.



#### Tabs Hold Roof Shingles Down Against Pressure of Wind

UNRULY shingles that curl up or tear off in areas of prevailing high winds can be kept in place with small tabs of sheet copper. Cut each strip about 1" wide and 2" long and nail one end under the free edge of each shingle, then bend the other end back on top of the edge to hold the shingle firmly down. The sketch shows how to do it for shingle strips.—C. J. Horton, Buffalo.





An old smoke-eater with a two-horsepower fire wagon

# Gus Answers By Martin Bunn a Fire Alarm



## makes things plenty hot for the Model Garageman.

THERE was an aroma about Sam Boise, and it had always been there as far back as anyone could remember. It was the smell of harness dressing and brass polish, a clean-scented reminder of the man's one love, his past and profession in a brawling, bright ly colored time that is dead forever. The aroma belonged with the fierce mustache of 60 years' cultivation, with the remnants of brass-buttoned uniform, and with the pride and nostalgia in the faded blue of his

THERE was an aroma about Sam Boise, and it had always been there as far back as anyone could remember. It was the smell of harness dressing and brass polish, a clean-scented reminder of the man's one love,

Sam stood now in Gus Wilson's Model Garage staring with an expression of distaste at the modern fire truck that Gus was busily working on

"Never had to give horses an overhaul' Keep 'em in hay and rub 'em down with burlap, and they'd always answer the bell."
"You're right, Sam. But trucks are faster."

"Faster!" Sam snorted. "We had two dappled grays, Harry and Old Dad, that could get to a fire as fast as any of these gas-belchers! I'd even say those two whites I got now would show a good race."

Gus grinned, Good old Sam. The old firehouse still stood, just a few blocks away. The fire wagon was still there, gleaming brass and wood, and bright red paint. Sam managed, too, to keep a pair of horses.

The old volunteer brigade had long since faded into the land of yellowed photographs, but Sam had stayed on. Not that he ever answered the alarm any more. But he turned the old firehouse into a sort of museum, sometimg for people to look at and remember. And the mayor saw that a dribble of civic funds kept Sam from run-

ning the place on pride alone.

"So you don't care for the gasoline age?"

"You know the old saving, Gus."

"Sure: 'Get a horsel'"

"It still goes. If the department still used horses, you wouldn't be breaking your back over that machine."

"Hey, old-timer, I've got to make a living! And besides, I

don't get a fire truck in here very often. They've got their own mechanic over at the firehouse. Just don't have the equipment to do a major overhaul, that's all."

Gus was fitting new rings to the pistons when the sound of a fire-engine siren wailed over the moon quietness of town.

"There goes one now," Gus said,

"It's a bad day for a fire. Dry wind. No rain in a long time."

"Yeah, looks that way. But they got that other truck to use while this one's out of commission."

#### An Old Fire Horse Never Forgets

Sam Boise fidgeted in the doorway for a moment. It was hard for an old fire horse like him to sit back and do nothing. He was near 80, but there are some things a man never forgets.

"I can smell it," Sam said.

Gus snuffed but got only the odor of the

grease in the garage. He continued his work, thinking about lunch.

A moment later, the phone rang

The voice at the other end was Fire Cluef Joe Insley's. Gus listened for a minute, and then hung up with a bang

"I've got to run, Sam. That engine just quit at the fire, and she's not pumping water!"

"What's burning?"

"The warehouse in back of Johnson's Hardware."

Gus jumped into his truck and barreled out of the garage.

The fire was only a short distance away, in an alley just off the main street. He knew the warehouse. It was loaded with piles of linoleum, furniture, plastics, fabrics. And almost jammed against the warehouse on three sides were wooden frame buildings.

When he was only a block away, Gus slowed up at the police line thrown around the area to keep people from under foot. A huge cloud of smoke was billowing up, dimming the sun.

"Let him through," he heard a voice shout, and saw Officer Billy Ryan waving him on.

He stopped at the

entrance of the alley. A long ribbon of hose stretched from a hydrant on the main street, through a building to the great water tanks in the truck, but it was of no use without the powerful pump to boost the pressure lost over the distance. Joe Insley came up to him with desperation in his face.

"Glad you're here, Gus. The engine just acted up all at once. She'll idle all right, but we have to lock the throttle at a higher speed for the pump to work fast enough. As soon as we try to go over an idle, she quits. There isn't much time. The fire isn't burning too fast now, but if it spreads to those stores of fabrics and plastics . . ."

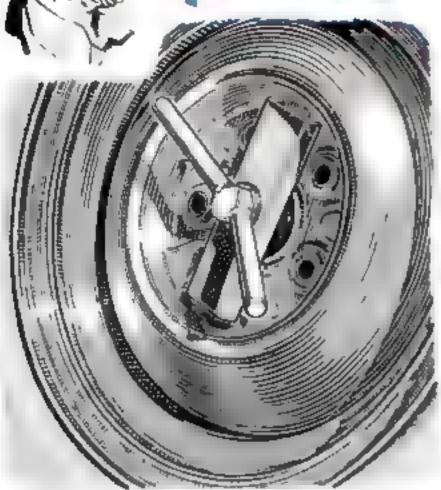
Gus lifted the hood and took in the engine layout with a quick look.

It wasn't easy, trying to diagnose engine trouble with smoke stinging his eyes, standing in a shower of ashes and sparks. One minute's delay might mean one spark too

[Continued on page 250]



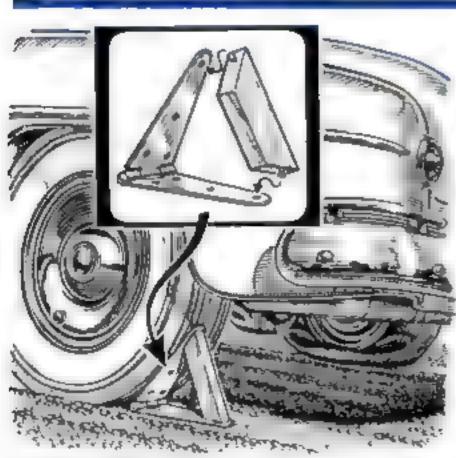
# FROM THE MODEL GARAGE



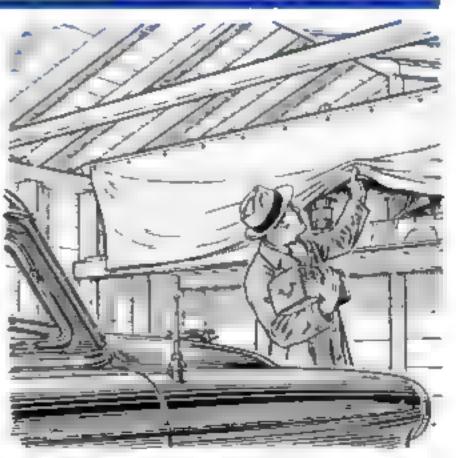
A spare-wheel nut becomes a quick-acting wrench for removing and mounting the spare in the luggage compartment when two 3%" lengths of %" rod are welded to it to form a handle. The handles also reduce the chances of the nut rolling out of sight.



A kitchen towel holder mounted under the deck lid with self-tapping screws will speed clean-up operation after you make roadside repairs or change tires. Keep waterless hand cleaner in the trunk to loosen the grime before wiping

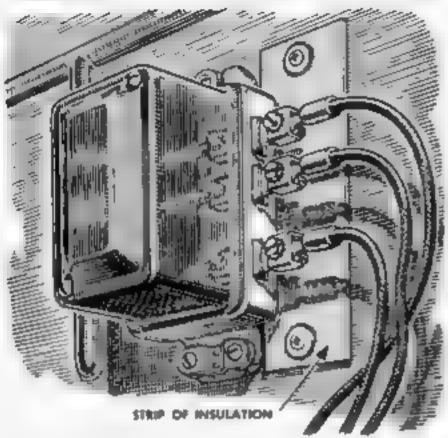


A collapsible wheel chock may save your car from an unexpected take-off when changing a tire. A nail protruding from each end of the wooden brace fits into the end screw holes of the strap hinge to hold it open. The chock folds flat for storage,

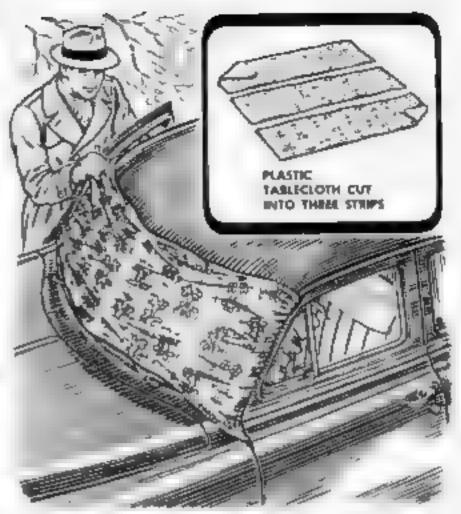


Clutter on a garage shelf can be hidden behind a canvas curtain. Tack the curtain to a wood strip over the shelf, letting it hang freely for easy lifting when something is needed. Protected from the weather, the canvas will last for years.

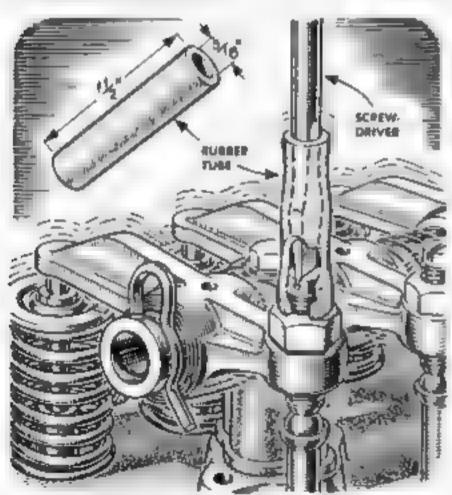
### MORE Hints from the Model Garage



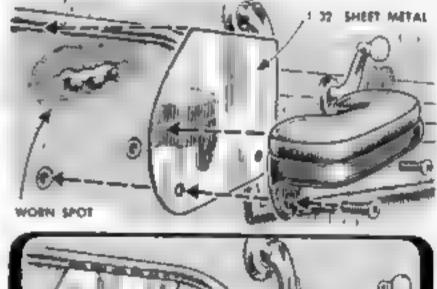
A possible cause of shorts is small clearance between the voltage-regulator terminals and the metal fire wall of a car. A strip of gasket material fastened to the fire wall behind the terminals will prevent shorts from bent terminals or oversize bolts. A tire patch comented to the fire wall could also i.e used.

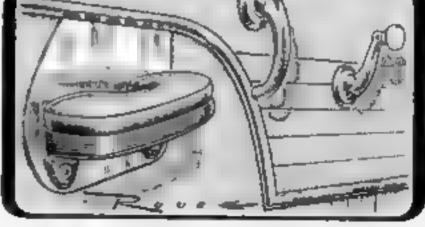


Steet on your windshield can be hard to remove—especially if the car has been parked for several hours. When icy weather threatens, lay a strip cut from a plastic tablecloth across the windshield and tuck it in the doors. When you return, you can remove the strip and shake the sleet off it in a few seconds.



A longth of rubber tubing shipped over your screwdriver will hold the tool in the slot while you adjust bouncing valve tappets. The hose fits over the adjusting screw and leaves the lock nut exposed for tightening when the right setting is made.





A stainless-steel plate fitted between the armrest and the door upholstery will save the fabric from wearing or cover an already worn spot. Ship the upper edge of the plate under the decorative molding strip and hold it in place with the armrest screws,



# New for the Handy Man

1. Plastic Planks Look Like Wood. Just nail up these plastic faced planks and you have a permanent, washable wood-grain wall that needs no further finishing. The 16"-by-8' planks are 3/16" hardboard coated with a smooth, tough bakedon finish that resists heat, moisture, dirt and stains. Tongue-and-groove edges hide nailheads and joints. The panels are available in four simulated wood grains, as well as 10 solid colors, and also come in 16" squares.



2. Clamp Seals
Pipe Leaks. Leaks
in water, steam, oil
and other pipes can
be quickly fixed with
this clamp-on mender.
The clamp is tightened around the pipe

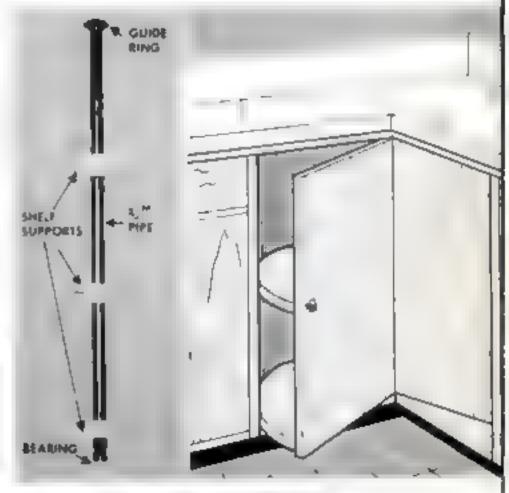
at the point of the leak and has a neoprene gasket inside that makes a waterproof seal. Two types fit elbows or straight sections and come in various pipe sizes.

3. Flashlight Has
Probe Arm. Pinpoint
light for probing in
small, dark corners is
instantly available on
this flashlight. Snapping out the hinged
arm automatically
switches light from
the main bulb to a
tiny one on the flexible probe tip.



Further information on these products can be obtained from.

1. March B all Products, Inc., Buter Ohio, 2. Holond Mig. Carp., P.O. Box 95, Bellerose 26. N. V., 3. L. S. Electric Mig. Curp. 222 W. 14th St., N. C., 4. Lake Brite Products Co., P.O. Bax 22, Edgerton, W.



4. Kit Builds Corner Shelves. You can add a set of revolving shelves to a kitchen corner cabinet with this kit of hardware. The top and bottom guides and three shelf supports are made to fit on a length of standard X" pipe, which can be bought locally cut to the right size. Shelves are made from X" plywood and simply screwed to the support rings.



# Glass-Fiber Mats

Here are a dozen new ways to put this familiar insulation to work, now that you can buy it in any length you need.

YOU can now buy glass-fiber insulating material by the foot or yard, and there are scores of ways to make use of it that you may not have thought of before. The drawings on these pages show a dozen or

so of its most practical applications.

The stuff consists of thousands of fine glass fibers held with binders to form a soft, light, flexible blanket as thin as %" and from 18" to 72" wide. So fine are the fibers and so closely bound that they cannot come loose or lodge in the skin.

You can cut the material with scissors, and then cement, staple or tack it in place and shape it to fit

almost any contour.

Called Super-Fine Fiber-Glass, it chiefly insulates against heat, cold or sound. But it is also fire-

resistant and verminproof.

It has many possible home uses besides those shown here. For instance, it can serve as blackboard erasers, sun-hat liners, cold shields for mattresses, pot holders, weather stripping, coat or boot lining, bed-family note and front blankets for

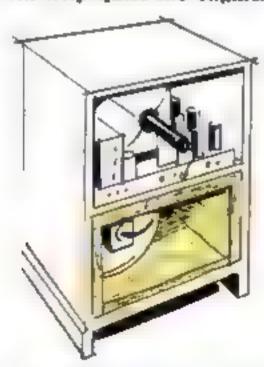
ding for family pets and frost blankets for

shrubs.

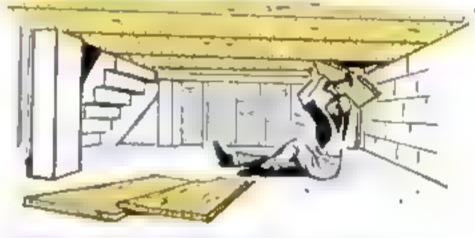
The handy material can also be used as a washable stuffing for dolls and to pad fragile items for mailing.



DEADEN CAR NOISE. Comented to the underside of your automobile hood, glass-fiber insulation will help quiet the engine.



IMPROVE TV SOUND. Line the speaker compartment of your TV cabinet to reduce highfrequency rattle and provide better tone.



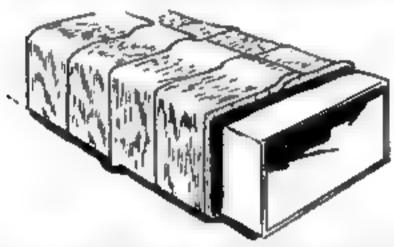
KEEP FLOORS WARMER, Staple insulating blankets under the joists in your cellar. This cuts off drafts and enables you to maintain more even temperature upstairs at less fuel cost.



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QUIET YOUR SHOP. Reduce power-tool noise within the room and insulate the rest of the house from it by applying glass-fiber blankets to the studding or over the furning strips.

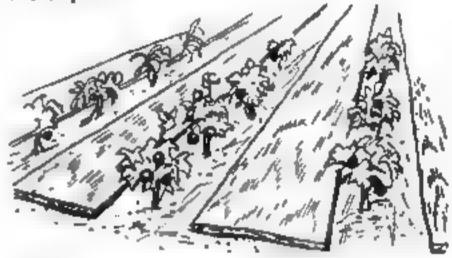


IMPROVE AIR DUCTS. Make both hot- and coldair ducts more efficient by wrapping them in Fiber-Glass, leaving a 3" overlap. Then cement, bind or staple the blanket in place.

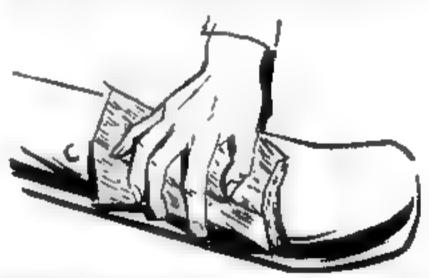








REDUCE CULTIVATING. Use strips of the insulating nusterial as a mulch. It keeps moisture in the ground and holds back the weeds.



SHINE UP CHROME, Cut into handy pad size and clean your car's chrome or the kitchen porcelain with Fiber-Glass. It doesn't scratch.





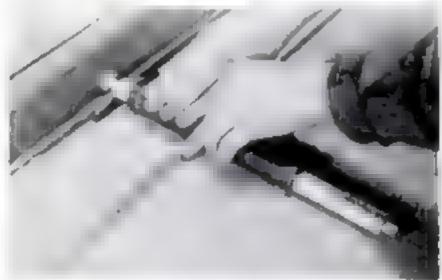
#### Rubber Collar Steadies Ladder

A RUBBER collar made of a short section of old tire casing will hold your ladder safely in place when you have to rest it against a flagpole, lamppost or other narrow upright. Nail the collar to a flat crosspiece fastened near the top of the ladder.—Bob Poulson, Los Angeles.



#### Tenons Cut with Dado Blade

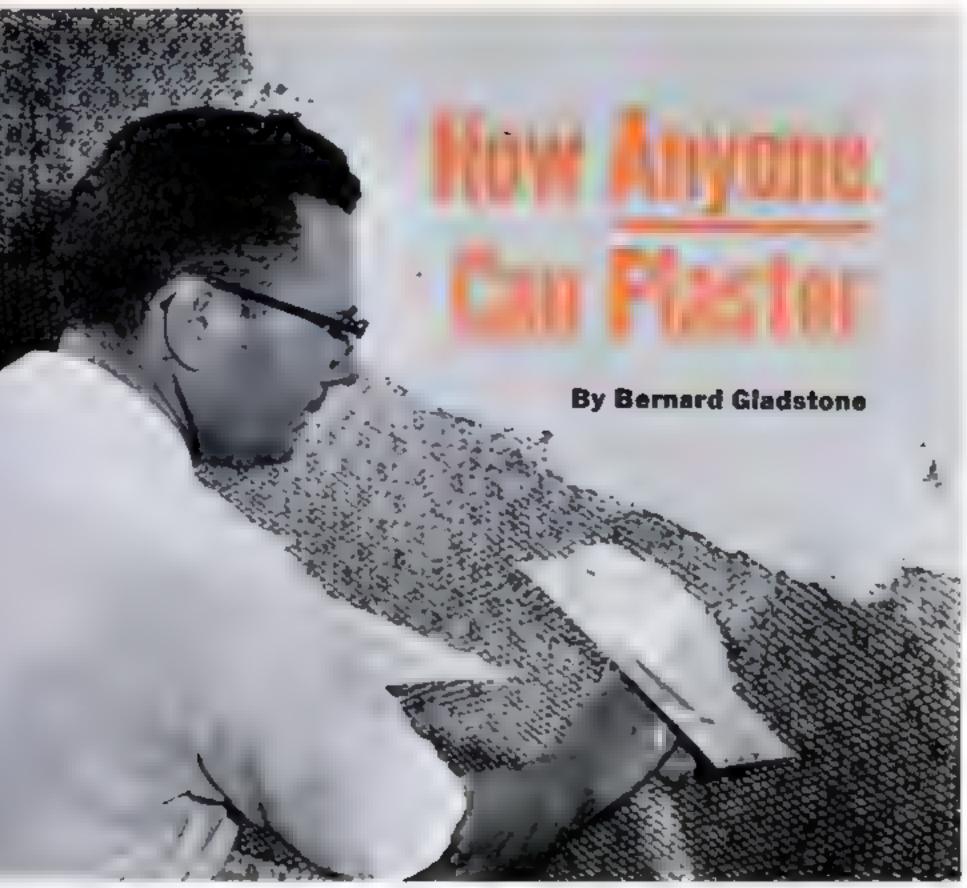
Texons are easily cut on any size of round stock with a dado wheel mounted in a bench saw. Above, Harold Jackson of Kankakee, Ill., holds the spindle against the miter gauge and slowly turns it against the blade. A board clamped to the rip fence protects the blade on short tenons. Below, Andor Andrews, Seattle, shows how to cut round tenons on square stock. The stock is slipped through a short tube, centered with wedges, and the tube rotated slowly against the miter gauge to give the effect of turning a round piece of stock.



#### Crown of Electrical Tape Steadies Wandering Sander Belts

Some sanders come with crowned idler pulleys, giving lateral stability to the belt. which has a natural tendency to center itself on the crown. If your sander pulley isn't crowned, or the crown isn't high enough for proper belt tracking, try cementing a ring of electrical rubber tape around the center of each drum. To remove accumulated dust before applying the tape, clean the drums with carbon tet or gasoline and let them dry thoroughly. Then brush a layer of rubber cement around the center of each drum and allow it to set until tacky. Wrap the tape firmly over the cemented area, rubbing out any air bubbles that may have formed underneath. Make a slanting butt joint. The resulting surface is durable enough for ordinary use.-Harry L. Truchelut, Atlanta





New plaster over old is latest trick for repairing damaged wall without tearing it down Lath is nailed over old walk, then covered with

new Led tweight plaster that adds modern, textured finish without extra work and weight of old-type plaster job.

# This modern, two-coat short cut lets you put a new wall over an old one—without even removing the wallpaper.

HAVE you always shied away from plastering a wall? Do you think of it as a job only for a man with long experience? Then listen to this:

Any able amateur can put up modern plaster walls—the type you find in hundreds of new homes. What's more, these walls can be slapped up right over an old surface, skipping the gritty, bomb-disaster stage of tearing down old plaster.

It's true that a slick, three-coat plaster job is just as difficult to achieve as ever, and if you must have that, better hire a pro. But what you can do yourself is simply skep the mean part—the final white coat that must be troweled glass-smooth. By letting two coats do the work of three, you end up with an intentionally textured surface that doesn't have to blush because it has some bumps in it—it's supposed to have them.

If you prefer plasterboard, you can also achieve a finish that looks like textured plaster. You do it with new plasterlike paints.

Wall on a wall. One of the developments that make it easier to put new plas-



Casing beads, made of netal cream with a process of the attached, and the rest of training of each training of the control of



2 Lath as nailed to stars to shall will kin strips a toos wild we rid of a property of the form of wist. Use 2" resident to shall we have the strips 2" as he were street and totals to tees full of after testids.



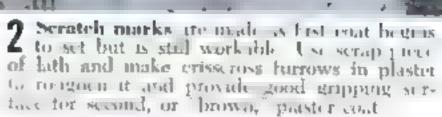
3 At corners, bend lath at we two by four and tap into place to task and stop in place to task and stop in the late of the lat



First plaster coat is troweled on just thick chough to cubed lith completely. Work plaster in and around lath to insure firm bond. Mix plaster to a still buttery consistency and work quickly, as it sets in about an hour.

ter on an old wall is a duapled metal lith that has a screek of small depressions pressed into it. These hold the lath about 'c' away from the wall so that plaster can get in bound and save the need for bothering with fraining stops.

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Another development that helps is that of new lightweight plasters which can be put over an existing wall without overloading the structural members. These come premixed like cake by ther and need or by water to make the pready to use. Containing ex-



4 Openings for outlets are

1 ther all s put up. Fix
1 the set but \$" to

brow to a bush with the plas
1 to 5 the be done with ex
1 to 5 the set but 5" to

tractos can be done with ex
1 to 5 the set of by blocking bey

onthet boxes or by blocking bey

on with wood from the built

5 New picture molding is slotted metal strip that's nailed to will \$11000 h. w.c.ah., Iter lath is in place. Strip provides a nost 1 to a content to handing pictures without tailing into 1 est 1 to a so sites as upper grounds, or 20 h. han or 20 mag thickers of past 1. At the same time, a \$7-thick wood strip sever late as with is nailed along base of wall to turn lower and ods. Strip also provides ruling saits of 1 to 1 mag on base board later.



3 a . I . SI . Red down flish with groun is with 1"-by-6" board that rides on picture molding at top and wood strip at hottom Low spots are filled, rough areas smoothed

tremely light aggregates such as perlite or verniculite, they weigh only about half as much as regular sanded plaster and me more fire-resistant, too. They're sold un loa variety of trade names, but you can be sure of getting the right type if you ask for 4 Wood float gives final finish to second out. Let plaster dry firm but not hard, then to don't over face with flit sircular motion licialt is smooth, sandy texture that makes attractive finish without further work

them by the names of the aggregates they're mixed with

How you do it. The lath comes in strips about 26" wide and 8' long. The only trick in putting it up is to make sure that it is nailed firmly to the study through the old

## BIG PLASTERBOARD SHEETS GO UP FAST, ARE EASY

wall. You can find the stude, usually 16" between centers, by tapping the wall or drilling test holes that will be covered with plaster later. Mark the study with a heavy colored cravon that will show through the lath. All lath strips must start and end on studs to insure a firm bond with the wall

With the lath up, the first or "scratch" coat is troweled on just deep enough to cover the lath. The second or "brown coat should then be put on before the first has completely dried, usually the following day. If you have to wait longer, wet down the first coat before applying the second. The final smoothing of the second coat produces a sand finish that can be left as is or further textured with one of the special paints

Putting up plasterboard. On new walls, you'll probably find it easier to put up your plaster in the form of big plasterboard sheets. These are 4' wide and come in lengths up to 12'. The 4'-by-8' size, however, is about the limit for easy handling by one person and just fits nicely across three stud spaces when put up vertically or six stud spaces horizontally.

The more common thickness is \$", but the %" will give you a more solid wall at only slight extra cost. Be sure also to get the recessed-edge type. These panels form a shallow depression along each joint into which you cement a special patching tape

to provide a smooth, flush seam.

The finished wall can be textured in any one of the several ways shown to hide nails and joints, or can be wallpapered. If you're going to paper, be sure to prime the wall first with varnish, or the wallpaper will stick so firmly to the paper face of the plasterboard that you'll never be able to remove it without damaging the wall.

This is paint? The new textured pamts are thick, pastelike compounds that look more like plaster and give similar results. They come in a variety of colors and in water-, rubber-, and oil-base types.

Simply brushed on and allowed to dry, these paints form a hard, sandlike finish that hides blemishes in both plaster and plasterboard. Or you can handle the paint in various ways to get different textures as shown in the photos.



Running sheets crosswise gives greater strength, fewer seams. Start panels at top of wall. Use broad-head wallboard nails, spaced 5" to 7" apart. Countersink each nailliead slightly to make hollow for patching coment.



2 Sheets are trimmen with and to score top Run knife along straightedge to score top reak Sheets are trimmed with any sharp knife. face of panel and snap piece down to break core. Then score bottom face and snap piece back up, and it will break off cleanly.



3 To conceal joints, first fill seams with patching cement, then press perforated tape himly into cement with wide-blade putty knife (above). Add enough more cement to embed tape fully and smooth out edges with blade.

4 Second coat of cement is applied to seam after first coat has dried. A wide plasterer's trowel is ideal for this. Feather edges out 6" to 8" on each side of tape to blend with wall. Fill all nailheads flush with face of panels.



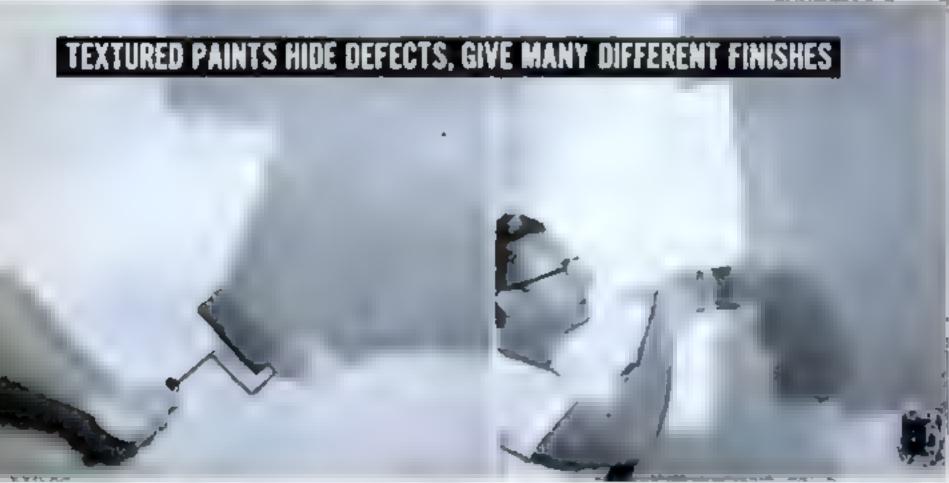
5 Ceiling joints are covered in same way as other seams except that tape is first creased down middle to form angle that fits in corner. For smoothest appearance, seams and millicads should be sanded after cement is dry.

6 New corner heads have metal reinforcements on back side of tape, making strong joints that won't chip or crack it accidentally humped. Beads come for inside and outside corners (inset), are comented like regular tape.



New glue-on panels are consided to will not store of not a considerate loss of pathods and a part of top over the store of a considerate loss of the latest and a panel plant contact and a panel.

with special not led spender that leves their abbets on his kot pixel best Pried is then pressed its was all traped fastily against precent pair wall two by for englit Paress come waite for parents at merches.



1 Thick, postelike textured point rasily lides to seem and natheads to plasterioral even when not studed smooth, as less Using roller halfs spread paint evenly provides slight stipple effect that can be lett us as.

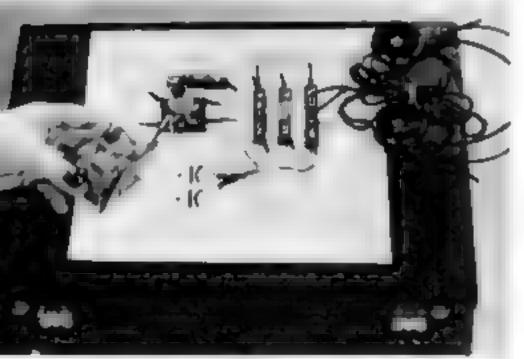
3 Paint can be textured on cither plaster or plasterboard walls in several case ways as shown below You can get a heavy stucco-like stopple by suapay darbing paint with spongeralter thick coat has been brushed on eleft).

2 Over plaster wall, textured paratells in small holes and trowel marks giving surface a smoother appearance. I not is worked into phister with hirish and can then be left as is for small faish or given a texture.

Modern stricted effect is obtained with wide tooth lair county teenter. Why has can be made by twisting combine your nove it along Swirls and other trochand to sizes our hour to by twisting a stiff-bristled bresh, right?



# PARTS ARE LAID OUT on perforated panel that forms one side of suitcase-shaped kit. Open, easily accessible arrangement makes it simple to run quick cheeks and substitute parts.



PAPER TEMPLATE has punched holes through which parts are plugged into panel. Diagram shows location of each part by number as well as symbol. Circuit shown is crystal set.

STORAGE BOARD holds spare parts in numbered order so each can be quickly taken out and put back in same spot. Connecting wires with spring-clip tips are in left foreground.

# Plug-In Parts Build 24 Radios

Solderless circuits assemble fast, let you change sets like a suit of clothes.

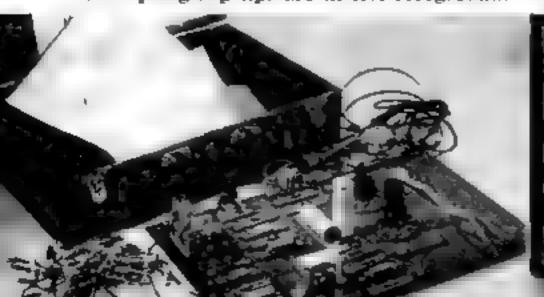
You can set up any one of 24 different radio circuits as fast as you can plug in the parts. When you are through with one circuit, it takes only a few minutes to unplug the parts and reassemble them into another one.

You do this by arranging a kit of tubes, condensers and other parts in various combinations on a layout panel. Each part is mounted on a pronged base that fits into holes in the panel. You can't make a mistake because there's a punched template for each circuit that fits over the panel and shows exactly where each part goes. Connections are made with spring-clip solderless leads that are simply slipped on and off terminal posts on each base.

Beginners can progress from a simple crystal set to a two-tube amplifier in a few hours, learning the function of each circuit as they go along. Engineers can set up test circuits in minutes instead of days of intricate fitting and soldering.

The kit of parts is made by Science Electronics, Inc., Box 237, Huntington, N. Y. Also available are blank plug-in bases and extra connectors so experimenters can make up their own circuits.

SINGLE-TUBE SET is one of two dozen that kit will build. Circuits can be arranged for either battery or external-power operation. Parts include line-cord clip, even antenna plug.

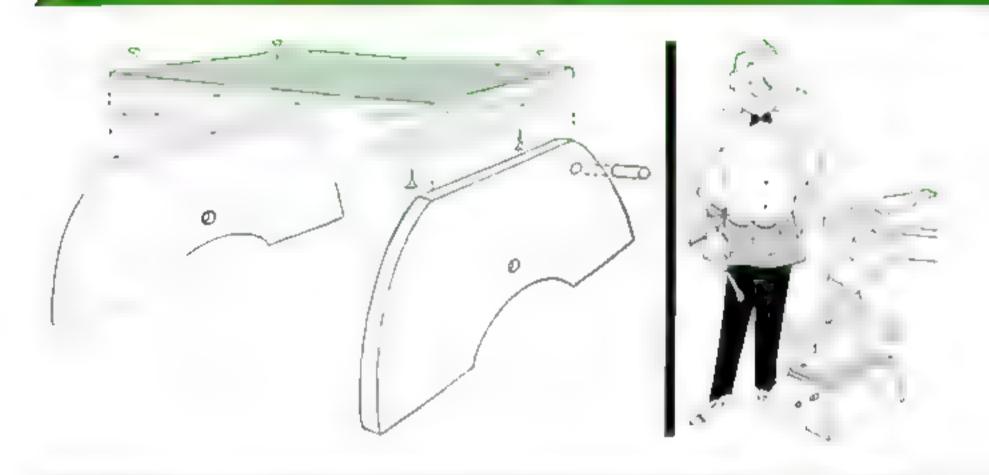


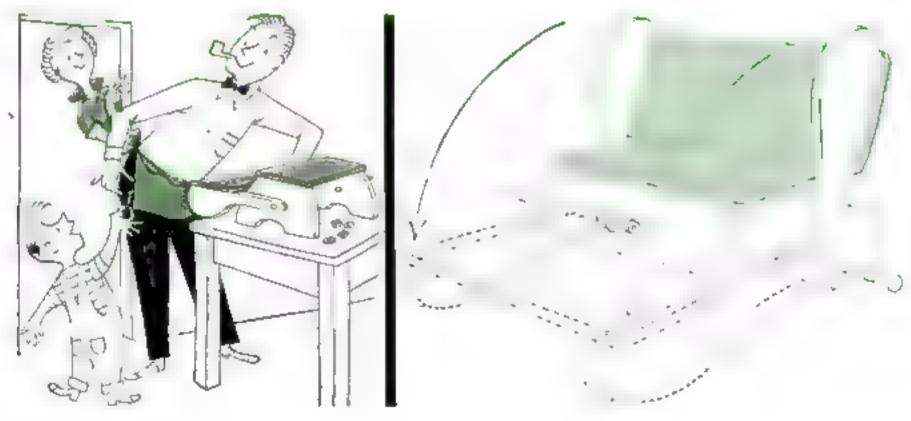


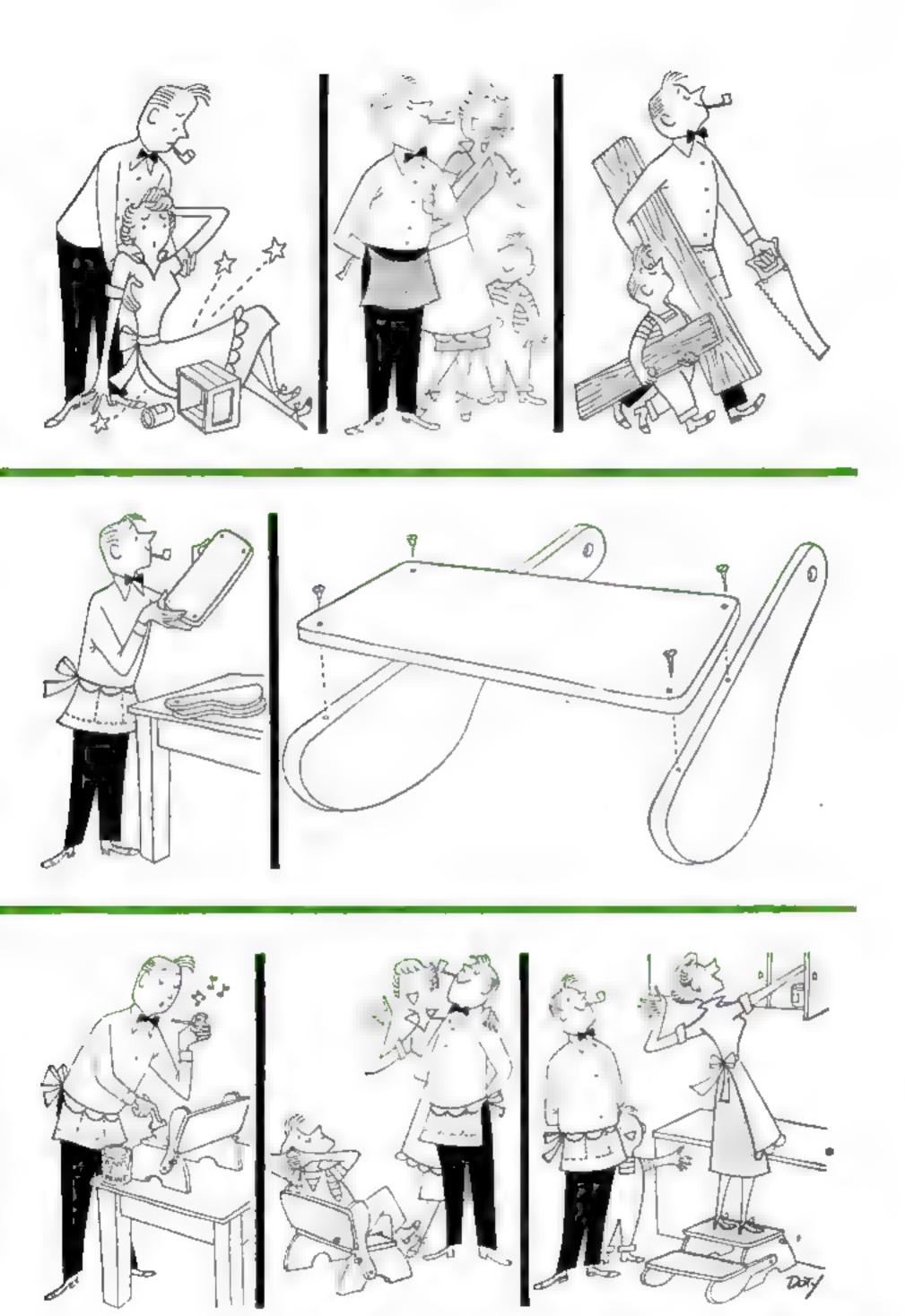
By Roy Doty and Edwin F. Thomas

# Wordless Workshop







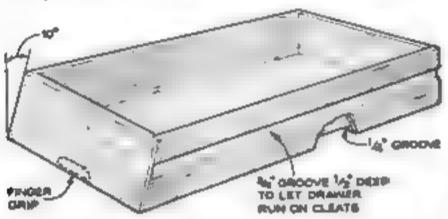


Next Month: a footstool that stores firewood.

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#### Slant-Front Drawer is Pulled Out by Its Clapboard-Like Face

There's no hardware tacked on the front of my cabinet drawers, but they are easy to open just the same. The front of each drawer slants out like a clapboard, with a finger grip rasped out on the underside. The slant was obtained by simply cutting one end of the sides at a 10° angle. Grooves cut in each side of the drawer ride on cleats in the cabinet.—Jerry Parker, Sonoma, Culif



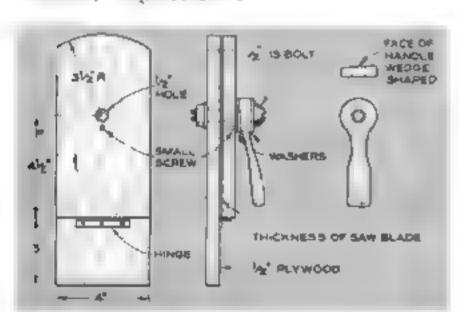
#### Saw Clamp is Quick-Acting



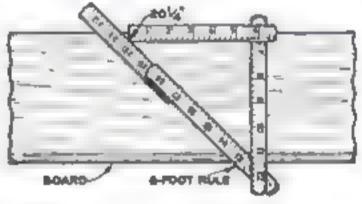
A QUICK-ACTING clamp lever on this saw-filing clamp lets you rotate the blade as fast as you can file teeth, yet it locks it securely while you file

Cut two pieces of %" plywood to make the body of the clamp. Hunge the two parts

and bore a %" hole at the radius centerpoint for a %"-13 bolt. Shape the handle from hardwood and file the inside face to a slight wedge shape. In use, the wedge rides up on the head of a screw placed close to the bolt hole, forcing the clamp tight against the saw. A twist of the wrist loosens it. Steel washers prevent the wood handle from being scored by the screwhead.—Will Thomas, Buffalo, N. 1

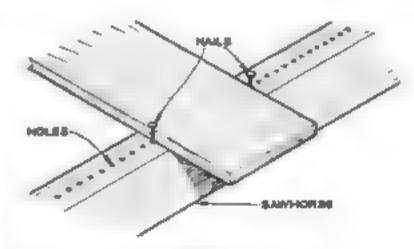


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#### Rule Serves as Square

IF you need a square and don't have one handy, you can improvise one (above) from an ordinary folding rule. Bend the first two sections so that the zero end just touches the 20½" mark. The resulting triangle will form a right angle.—Lewis Booker, Louisville, Ky.



#### This Sawhorse Won't Shy

BOARDS stay in place for sawing with only a slight downward pressure of the hand when the top of a sawhorse is drilled at close-spaced intervals and nails are inserted in two holes, one on either side of the stock being cut.—William B. Eagan, Louisville, Ky.



# Here's the low-down on fastening anything from a pin-up to a whatnot. The secret: know your wall, your load, your fastener.

If YOU'RE the man in the house, inevitably there comes a time when you must fasten something to a wall. The object may be anything from a calendar to a cabinet. Whatever the object, there's no reason the job should stump you.

Fortunately American manufacturers have provided special tools and devices to help you. But before you start, answer three questions:

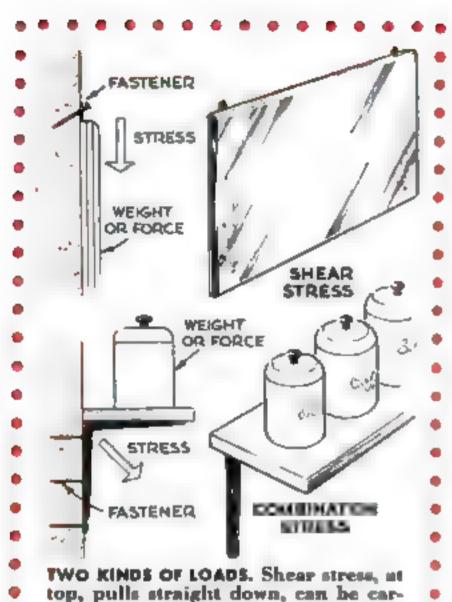
- What is to be fastened to the wall?
- •What kind of a wall is it?
- •What type of fastener is best?

What is to be fastened? Basic, of course, is the weight of the object you're going to fasten to the wall. Anything under five pounds is a light load; anything over 25 is heavy.

But, regardless of weight, everything fastened to a wall falls into one of two classes.

Shear stress. Flat objects, such as pictures, mirrors, pin-up lamps, clocks, etc., exert a straight-down pull.

Combination stress. Objects such as towel racks, drapery rods, can openers, shelves



and cabinets pull both outward and downward on the fastener. The use to which these objects are put adds stress. So you must use stronger fasteners.

ried by relatively light fastener. Com-

bination stress, below, pulls both out

and down, requires heavier fastener.

What kind of a wall? What your wall is made of and how thick it is determine the type of fastener to be used. If you don't know, find out by removing an apphance where a raw edge will show.

Wood walls. These may be thick (%" or over) boards or thin (%" or less) wood, plywood or fiber composition panels. Fasteners also may go into thick wood trim.

Plaster walls. These may be plaster over wood lath, plasterboard, plaster plasterboard. In remodeled rooms we may find thin wallboard over any of these.

Masonry. Masonry walls may be of brick, stone, hollow tile, concrete blocks or poured concrete.

Tile walls. These may be faced with ceramic tile, imitation ceramic, metal or plastic tile. Thin sheets of marble are often set in a plaster backing like tile.

What type of fastener? Adhesives will carry light loads. Some handy new gadgets, such as hooks and towel racks, carry their own adhesive. You merely moisten, press in place and hold for a minute or two, then

let set for a few hours.

But remember that you are fastening to the surface only, usually to a layer of paint or varnish, and cannot expect too much strength. Also, if you take it off later, you'll have to refinish the wall. Adhesives are especially useful with ceramic tiles, which are brittle and easily cracked. They can be drilled but the operation is risky. It is much better to use cement. (Don't confuse adhesive cement with the cement used for setting tile.) If the object will not adhere, chip off the glazed face of the tile with a sharp punch. Then cement it again.

Thumbtacks or pushpins may be used to fasten very light objects such as calendars, pictures and ornaments to wood and plaster walls. There is, however, always the danger of chipping plaster with even the smallest driven fastener, although driving it through a piece of adhesive tape will lessen the risk

Thin brade and nails may be used for light or medium objects having shear stress on wood or plaster walls. But picture nails are better. They are held at the proper angle, are specially pointed to penetrate plaster, and are available in sizes to hold up to 30 pounds. Nails and brads should be driven in at an angle of about 45° for greatest strength.

Masonry nails will hold light and medium weights on brick, stone and concrete-

below with drill holder in rubber grip, At right, one-piece impact drill.

STAR DRIUS resemble impact drills but have four cutting edges instead of three. They are used with the beavier hammer shown.



block walls. They may be driven readily into mortar, bricks or concrete blocks, but may chip or crack poured concrete.

Split nails also will hold medium or fairly heavy weights on masonry walls. They are driven into holes drilled at any desired point, the holes being slightly smaller than the solid shank of the nail. They also are available with a bolt head.

Screws provide greater strength and resist pull much better than nails. Driving a screw into soft wood, you'll find a hole made with an awl okay for very small screws. Larger screws should be driven into pilot holes to assure straightness and full strength. Make your hole about three-fourths the diameter of the screw core for soft wood, nine-tenths for hard wood. The hole should be slightly shallower than screw length.

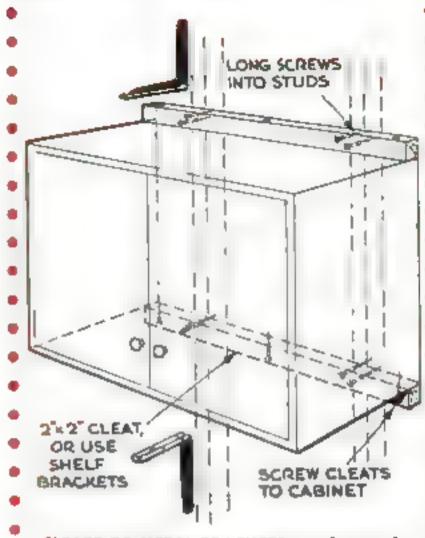
How to drill holes. Since drilling holes is important for both screws and bolts, let's take time out to run down the best tools and methods.

Twist drills will go through wood, plaster, metal, or even tile. Punch a dimple where you want the hole. Drill slowly and carefully at right angles to the wall. Don't press too hard, particularly on thin walls, or you may break away the inner surface. When you drill plaster or tile, use an old or cheap drill. Plaster will dull any twist drill very quickly.

But there's a better tool for driling plaster; the impact drill. This works like a miniature air hammer. It chips away the plaster a little at a time, yet will make a neat, clean hole almost as quickly as a twist drill. It will make hundreds of holes before getting dull and can be sharpened quickly and easily on a grinding wheel, it can also be used on mortar, ceramic tile, brick and concrete.

Start the hole by tapping with a light hanimer just hard enough to make the drill cut. If you tap too hard, the drill

HOUSEHOLD KIT contains variety of most commonly needed fasteners. Widely available, the kit shows you different types.



CLEATS OR METAL BRACKETS can be used to support a really heavy object such as the cabinet above. Either mounting device should be fastened to the study by wood screws.

will jam. Rotate the drill about a quarter turn between taps. Don't let the drill wobble or you will get too large a hole. After you get the knack of rotating the drill, try lifting or jumping it each time you turn it. This helps to remove dust from the hole and speeds cutting

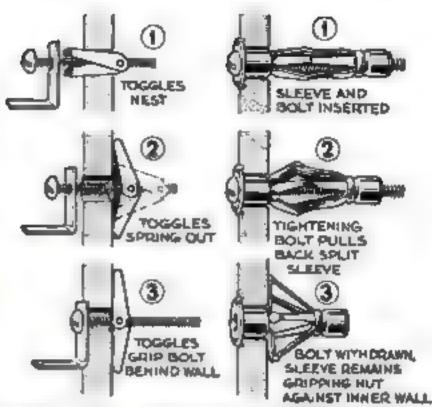
When starting an impact drill in ceramic tile or concrete, first make a dimple the approximate diameter of the hole by chipping away the hard surface with a sharp punch. If you don't, the drill may fracture too large an area of the surface.

While you can drive wood screws into holes drilled in plaster, tile or musonry walls, they won't hold much. The threads

makeshift screw anchors for pineter walls can be made from lengths of a round wooden pencil. Push out leads with a wire.







TOGGLE BOLTS AND WALL ANCHORS are used with heavy loads. Toggle's wings spread against the inner face of wall. Split sleeve of anchor bolt locks as bolt is tightened.

will crumble the material, or if the material is too hard, it will destroy the threads. Plaster screws, however, have deep threads the full length of the screw and will hold fairly well. Better still are handy devices called expansion shields. For light and medium work the shields may be made of fiber or plastic. One popular make of fiber shield—the Rawlplug—has metal-lined holes to prevent the screw threads from cutting the fiber. These also are available in large sizes for holding heavy screws in masonry walls.

To insert a wood screw into a plaster wall, select an expansion shield only slightly larger than the major diameter of the screw. Drill a hole in the plaster slightly smaller than the expansion shield and as deep as that part of the screw which will enter the wall. Select a fiber shield no longer than the threaded part of the screw (cut it off if necessary) and push it down to the bottom of the hole. The smooth shank of the screw should not enter the fiber shield. Forcing it in may twist off the head of the screw. If the hole goes through the plaster wall, insert the screw a few turns into the shield before inserting the shield in the wall.

Common sense is a pretty good guide as to size of screws to be used. Obviously there is no point in using a screw longer than the wall is thick. As a rule-of-thumb, we might use anything up to No. 4 gauge for light work, 5 to 8 gauge for medium, and anything over that for heavy. Actually, since



ADHESIVE-HELD ANCHOR NAILS can be used to hold furring strips to masonry. Smeared with mastic, anchor is pushed against wall with a twist. Next day, strip is driven against nail-

concrete NAILS look like common type but are harder and tougher. Above, long ones are being used to fasten two-by-fours to a concrete wall; short, for furring strips.

you lose nothing by using a screw heavier than you really need, play safe.

Bolts are useful, too. When you want to fasten something to a thin wall, a toggle bolt provides a handy solution. This device also may be used on thicker walls if screws will not hold. A hole slightly larger than the folded wings is drilled through the wall. The wings are removed so that the bolt can be passed through the object (for instance, a metal shelf bracket) to be fastened to the wall. The wings are then replaced, folded and passed through the hole in the wall. The single-wing type works much the same way. The wing is pivoted offcenter on the end of the bolt, so that one arm is longer than the other. When inside the hole, the heavier part tilts down and permits drawing the wing flat against the

wall. A toggle bolt cannot be removed without dropping the wing inside the wall.

Patented wall anchors are used like toggle bolts. One type, the Molly, consists of bolts fitted into

sleeves having a threaded section at the far end, a slit and scored center section, and a plain rimmed section which passes through the wall. The fastener is inserted in the wall through a hole slightly larger than the tube and the bolt is tightened. This causes the slit section to expand, anchoring the device inside the wall. The bolt is then withdrawn and passed through the object to be fastened, then reinserted in the wall. Besides being removable, the wall anchor does not need as large a hole as a toggle bolt. It can be removed by forcing the expanded section back to its original shape with a long punch or nail, but cannot be re-used.

Fastening heavy objects. Other types of wall anchors, inserted in holes drilled in the masonry, are useful where heavy objects must be fastened to masonry walls and floors with removable bolts or machine screws. The expansion-shield types have internal nuts which expand the split shields when the bolts are tightened. There are many variations of the anchor types having either split or soft lead shields. Some are tightened by the bolt action, some by ham-

mering the rim with a special tool or piece of pipe. One variety is made so that you insert the bolt head down, leaving the threaded stud extending from the wall

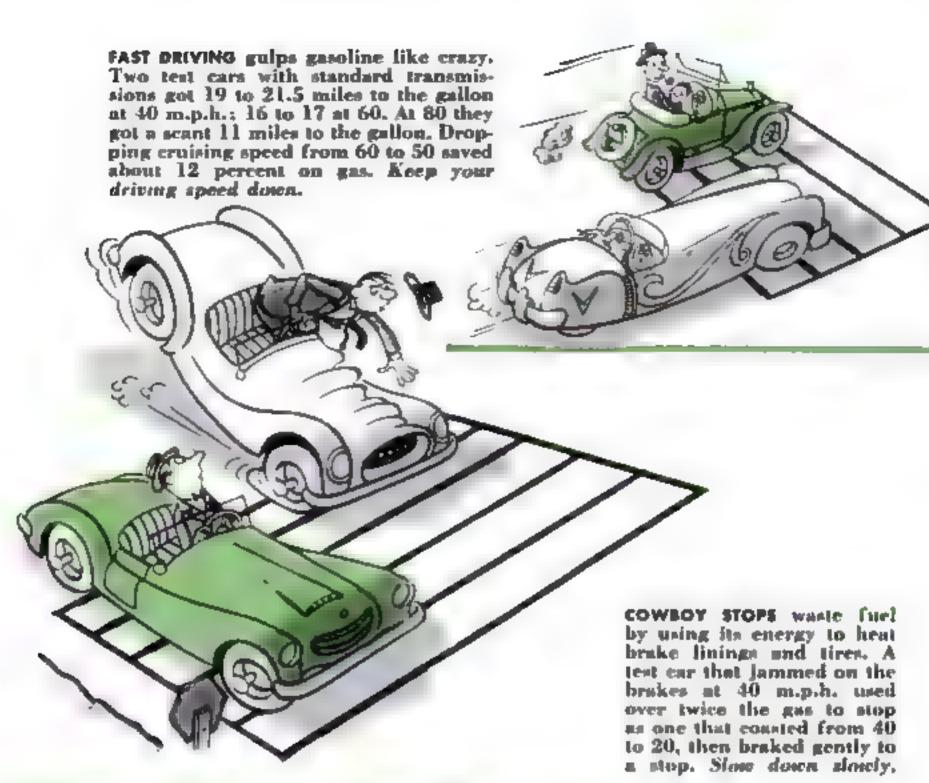
Screws in lead ex-

pansion shields are another good fastener for heavy loads on masonry walls. These work just like wood screws with expansion shields. Shields are available to take wood screws or the heavier lag screws which are tightened with a wrench. Lag-screw shields are marked with the diameter of the screw

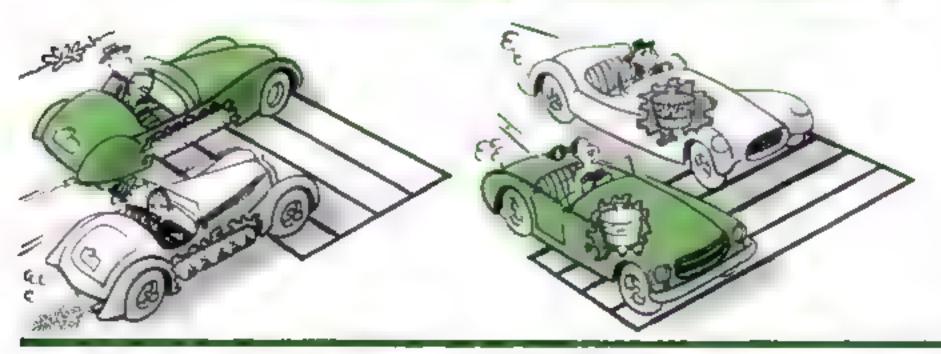
PILOT-HOLE SIZE
DEPENDS ON CORE

SCREW CLOSE-UP shows how sizes of pilot hole and clearance holes are determined.

[Continued on page 248]

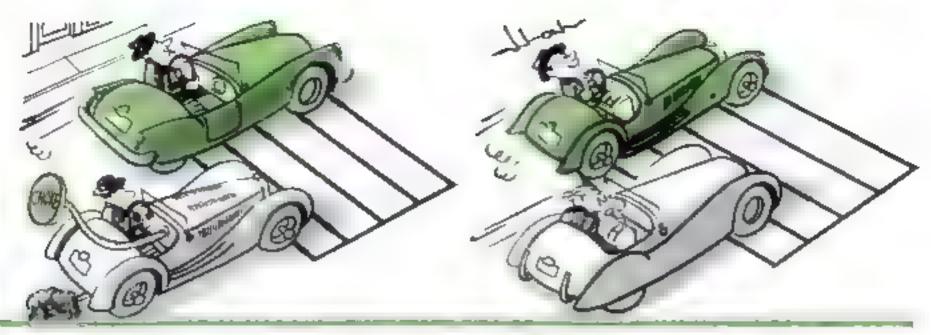


# Eight Ways to Save Gasoline—and Dollars



A DIRTY MUFFLER gives you a dirty deal. It builds up exhaust back pressure, and every pound per square inch steals slightly over two percent of your power. Fuel use climbs about three percent for 1 p.s.i. of back pressure; five percent for 1.4 p.s.i. (A straight-through muffler ups power, changes fuel use little.) Keep muffler clean.

A FILTHY AIR CLEANER makes your car "breathe" hard—and wastes fuel. In the 20-to-60-m.p.h. range, a really dirty cleaner costs about 1.5 miles to the gallon. The test used an oil-wetted, screen-type cleaner fouled with the dust from driving 200 miles on a gravel road 30 yards behind another ear. Have your filter cleaned twice a year.



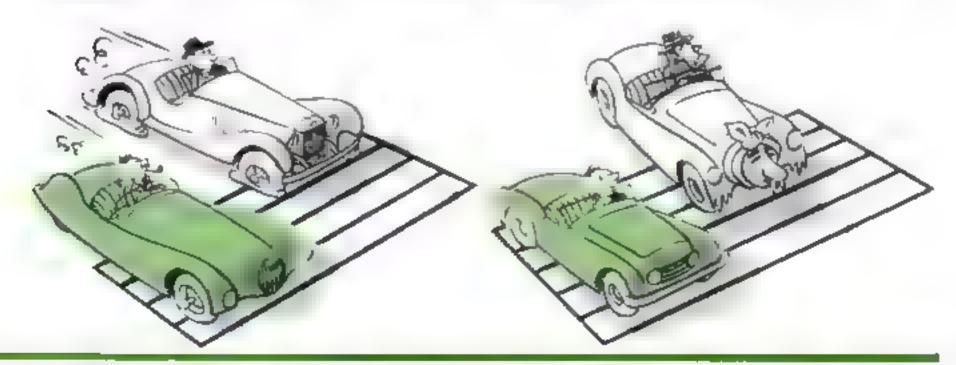
CARELESS CHOKING can keep you heading for a filling station. If a hand-choke knob is out more than ½"—15 percent—you lose money. With choke 40 percent out, a car made only eight miles to the gallon, compared to 21.5 miles with choke all the way in. (Defective automatic choke rould cause similar losses.) Lee your choke as little as possible.

JET GETAWAYS are fine for the fly boys—but will cost you gasoline. Accelerating at wide-open throttle costs you more gasoline than at part throttle. Fuel consumption is highest in first gear, lowest in third. So the more you can stay in third, the more gas you'll save. Accelerate at part throttle—and accelerate in third as often as possible.

# Good driving can cut your fuel bill by as much as one-third— and looking after your car properly will add even more economy.

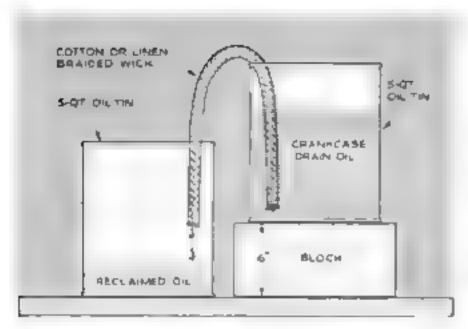
AUTO designers are putting some fancy engineering into making your engine run more miles on less gasoline. But there's one vital part they can't redesign—you. And often it's this part behind the steering wheel that wastes the most gas.

Just how careless driving and maintenance spill fuel down the drain is shown here. The drawings are based on a report to a section of the Society of Automotive Engineers by three Ford researchersH. S. White, O. Enoch, and A. L. Haynes. Actually, even with perfect driving, only about one gallon of every six you buy does useful work pushing your ear. The other five are eaten up largely by friction and heat losses. But the report shows that driving habits can make a lot of difference in how far that working gallon takes you. Driving the same cars over the same mail run, good drivers averaged 15 miles to the gallon; poor drivers, only 10,



LOW TIRE PRESSURE means high gas consumption. A car running 30 m.p.h. with a normal load wastes about 15 percent of its power for every four pounds the tires are underinflated, due to increased road friction. At 20 pounds per square inch, tires absorbed 7.6 brake horsepower; at 28 p.s.i., only 5.76. Keep your tires properly inflated.

coth engines are gas-hungry engines. It takes about five miles for a car to warm up after a cold start. A car left in the open used about 15 percent more fuel than when its engine had been prewarmed to the temperature of a garaged car. The outdoor car also took twice the distance to warm up. heep your car garaged in cold neather.



#### Wick Reclaims Crankcase Oil

You can reclaim some of the many quarts of good, usable oil you throw away each year. It still is fine for shop use. Next time you drain your car oil, pour it into a 5-quart can and set it up on a block beside an empty 5-quart can. Make a wick of linen or cotton strips braided into a rope about as thick as your thumb and lay it over the edge of the full can so that one end rests in more than half the depth of the oil and the other dangles in the empty can. The oil will creep along the wick by capillary action, filtering out the sediment as it goes. Any water or gas in the oil will evaporate.—D. R. Gladish, Cape Guardeau, Mo.



### Machine Tape Makes Memo Pad

A ROLL of adding-machine tape about 3" wide, a wire coat hanger, a 6"-by-10" piece of hardboard and a hacksaw blade will make a handy memo pad for kitchen or shop. Cut and bend the wire to form an axle for the tape roll, bolting it to the top of the hardboard. The hacksaw blade is bolted to the bottom, teeth down, for tearing off the tape.

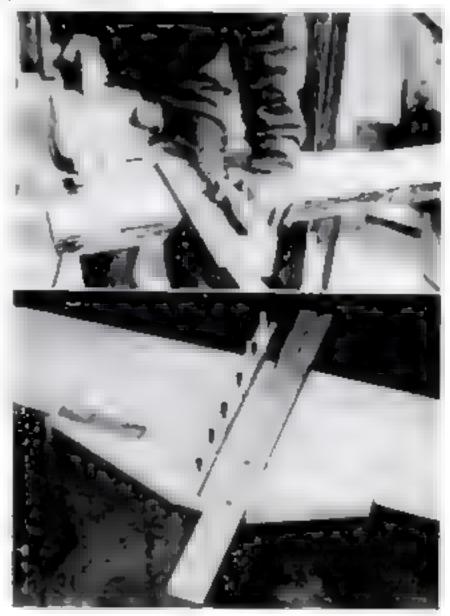
### Jig for Portable Saw Squares Ends of Planks

SQUARING the ends of lumber up to 12" wide is a cinch if you use this jig to guide an electric handsaw. It amounts to a wooden T square, with the tongue made of stock thick enough to guide the edge of the saw. Short "" dowels let you hook your left thumb around the jig to lock it against any width of plank during the cut.

If you make the end of the T-square head slightly long, the saw will cut it off on the first pass; then the edge becomes a cutting guide, to be lined up with the pencil mark on the work on all future cuts.—Joseph Williams, Erie, Pa

### **Emergency Trick Starts Motor**

Not wanting to tie up the motor of my grinder-polishing machine when the starting winding burned out, I used a piece of clotheshine to start it like an outboard motor. With the rope wrapped around the shaft, I turned on the electric switch, gave a snappy yank, and off she went.—Edward Mayover, Philadelphia.



220 POPULAR SCIENCE



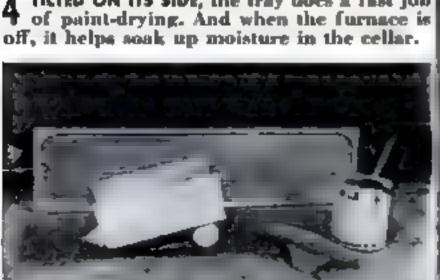
REMOVED from its wall-installation frame, the aluminum-backed glass grid shown here helps cook breakfast, fry eggs, toust bread and bring coffee to a boil, it's also a whiz at harbecues, and makes a perfect food warmer for the harried housewife.

PARTS NEEDED to convert the heat panel into a portable tray are four suction cups, a length of lamp cord and a plug. The suction cups are attached to the aluminum reflector plate to serve as legs or fasten it to wall. Hundles can be added to the ends.



ART FROM ITS KITCHEN DUTIES, the heating tray is a first-rate handy man. Gluethunning is right down its glass alleys.

TILTED ON 175 SIDE, the tray does a fast job off, it helps soak up moisture in the cellar.



# Radiant Heat Panel Is Jack-of-All-Trays

Designed as a wall heater, it can also fry eggs, warm baby's bottle, and handle shop jobs.

By Jerry Parker

5 made for, the tray clings firmly to the BACK AT THE ROOM-WARMING JOB II WHA wall, held there by its rubber suction cups-



# You Can Turn Metal Into

Get next to a screw-cutting lathe to relax, gain a fresh

### By Will Thomas

You're missing plenty, I'm convinced, if you don't own a metal-cutting lathe. That goes even if you are a doctor or lawyer, cop or cowman. Listen to this, which happens to come from a banker:

"For years I came home from work, sat down and read the paper, had dinner and then read some more. The sedentary life was beginning to get me. One day a friend suggested that I try doing something with my hands—maybe metalworking.



# Says Who?

Will Thomas is an advertising manager by profession and a machinist by inclination. He began about 15 years ago, Today be has an elaborate shop, planned just for fun, though he does write articles about machine work. His shop includes a photo darkroom and a perpetually anfinished HO-gauge model railroad. Always glad to show others how machine tools work, he is proud that ceveral of his "students" have graduated to shops of their own.

For another example of Thomas' work, see his wall-fustener article on page 213.

"Now I have a shop I am really proud of —most of it purchased with the money it earned. Since I've had a good-paying position for years, it has never been a question of having to get out in the shop and work. But there is still a real thrill in being able to turn out something that's worth cash.

"I well remember my first 'outside' job. It was at the beginning of the war and all equipment was scarce. One of the bank's customers, a man who ran a large machine shop, casually suggested I make a set of collets for him. With some misgivings I bought tool steel and set to work. I did the job on Sunday and delivered it on Monday. He paid me twice what I expected, as I did not then know what to charge.

"After that I made gauges, special aircraft and military parts, lens mounts and surgical instruments. At the completion of every job I was a wiser and much happier person. I don't do much 'outside' work these days, though I could still be busy every night and all weckend if I wished. But I still get never-failing pleasure in donning a pair of old trousers and going into the shop."

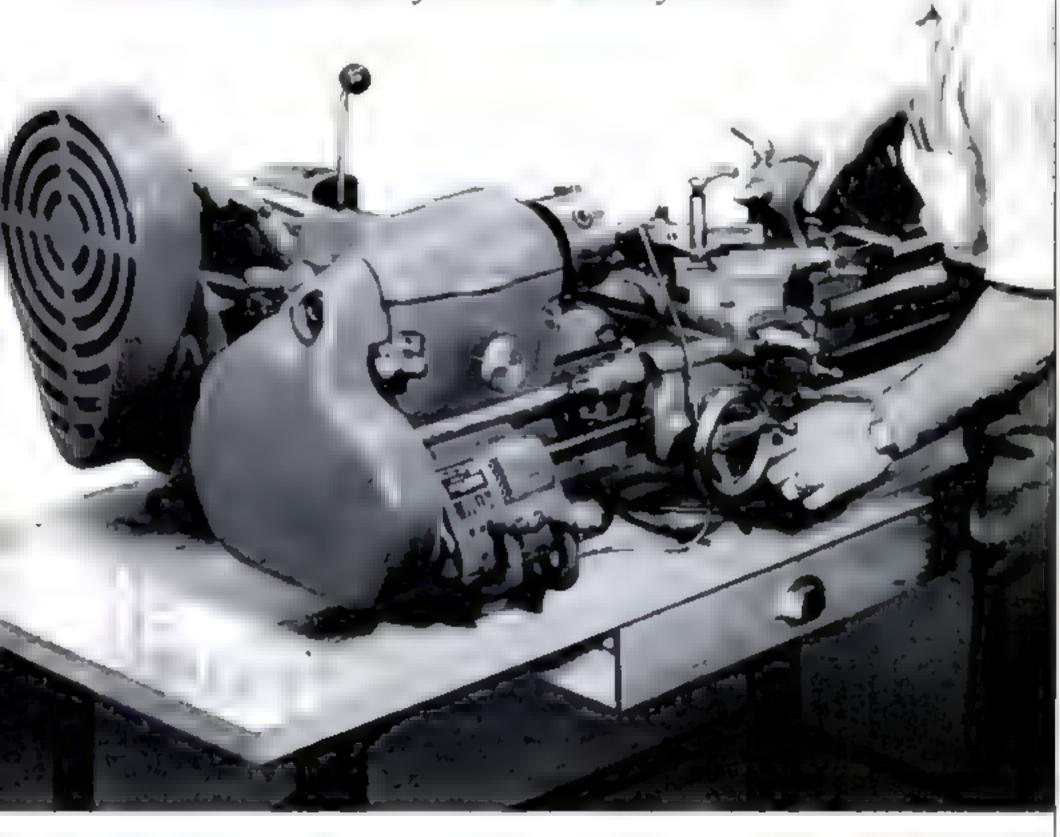
Paring steel. A metal-turning lathe is the king of all power tools. It is a precision instrument that will do some amazing things for you at the touch of a button or control wheel. You can peel a ribbon of

LATHE-MADE TOOLS will help stock your necessory shelf. Below are mandrels, a filing guide, ball-bearing pipe center, surface gauge and others you can turn out as needed.



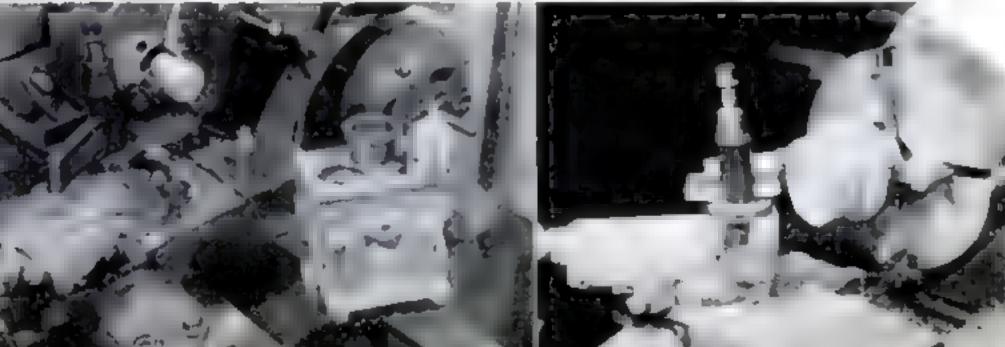
# Pleasure or Profit

outlook and use skills you never knew you had.



MODEL ENGINES are favorite projects with many fathe owners. Here ring grooves are turned in a piston for a two-cylinder engine. The block and other piston are on the ways.

TAINT ROUND. The lathe can turn out-ofround shapes when work is deftly off-centered. Here an elliptical cam, offset in the four-jaw, is turned one side at a time.



metal from a steel bar as easily as you pare an apple. You can cut threads so fine you need a magnifying glass to study their shape. You can work to a thousandth part of an inch—or split that thousandth still smaller if necessary.

Put a steel bar in the chuck, flip the switch, and look! you're cutting metal with metal. You are using the hard metal of a cutting hit to skim the softer steel of the work. If you want to tackle something harder, switch to a carbide-tipped tool. With it you can shape most anything this side of a diamond, including hardened

With your lathe you can build a working steam locomotive or rebuild that faucet on the kitchen sink. You can make a brass lamp, a set of stainless-steel chessmen, or an experimental engine that you've dreamed up yourself. What's better, you can have a whale of a lot of fun at it.

What is a lathe? Basically, it is a machine that rotates work against a fixed cutter. If you already have a woodworking lathe, you can turn soft metals on it by adding a slide rest. This is a mechanical tool holder, controlled by two screws, which holds the cutter rigidly and moves it along or crosswise to the bed. It won't cut

threads or handle large jobs, but with care you can make simple machine parts and models, particularly from dural, brass and plastics.

Once you've sampled metal-turning, you will almost certainly want a back-geared, screw-cutting lathe. This is the job that turns metal with power and precision. It's called back-geared because the headstock houses gears that will give you the slow, powerful speeds needed for some jobs. One common workshop lathe lets you run the spindle at 16 different speeds ranging from 28 to 2,072 r.p.m.

It's called screw-cutting because the cutter can be power-driven along or across the ways at exactly predetermined rates. This means that a sharp-pointed tool will cut screw threads. By changing the gear train on most lathes, you can produce threads from 4 to 160 per inch-including U.S., British, metric (and probably Martian) threads, inside or outside, straight or tapered.

Don't get the idea that a lathe is useful only for producing round shapes on round workpieces. That's a common misconception. A lathe is an excellent machine for producing smooth, accurately flat surfaces, if necessary at precise angular relationship

to other parts. With common setups and attachments, a lathe will make slots, grooves, cams and even gears.

Fun with a lathe. It is pleasant to run your lathe just for the heck of it. Try all the things a lathe can do, and operate it if and when the spirit moves you. You'll be surprised how often the spirit does so.

It will be a big help in maintaining your home and car. You can make parts for appliances, trick plumbing rigs, special brackets and fittings, (Warning: watch out for neighbors here. Once you make a special part that keeps Next Door's washing machine running, the path to your shop door

will be worn smooth.)

Don't forget that a lathe is the greatest tool-making machine in the world. You'll use it to make many of its own accessories—such as mandrels, arbory and collets. While you are at it, turn out some special hammers, punches, clamps, vises and the like. It is permissible to show these shiny tools to an admiring friend and say nonchalantly, "Made them myself in a few evenings."

You can sharpen tools precisely on a lathe, too, since the slide and feed screws give hairline control. For a serious model-maker, a lathe is almost a necessity. If you like engines, there's a wonderful array of working miniature steam, gasoline and

Handling Wife ...

Your helpmeet may not at once take kindly to your spending time at the lathe. Promptly making domestic repairs, and pointing out how the lathe helps, is a wise dodge. A few domestic projects—a lamp, ornamental door knocker or candlesticks—may soon have her telling friends, "George made this himself." Such domestic-relations jobs may save you the fur coat needed to treat stubborn cases.

[Continued on page 244]



For quick thawing, steam frozen ment in a covered colander set over boiling water. In minutes the pieces can be pulled apart—a good trick when unexpected guests arrive or the cook makes a late start on dinner

Grosning pipes that set up a racket when taps are turned on can often be silenced if you take the sag out of them. Strap them up with additional pipe supports on the overhead joists in the basement.



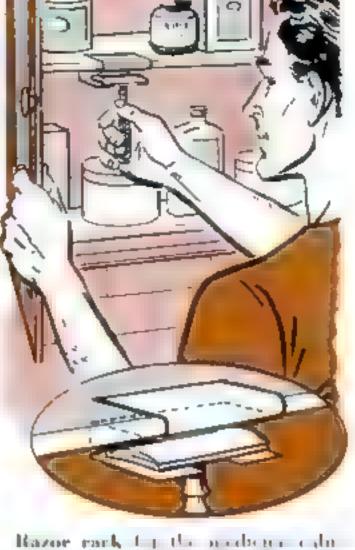
Screws that fit are always right there for re-use when you store a hinge with the fasteners attached. Fold the binge flat with the screws inserted head to head; then wrap tightly with tape or rubber bands. **More Home Tips** 



Kitchen file drawer keeps small items bandy caus, cartons or bottles that get last on your pantry shelf Cut wooden sidepieces to fit the drawer Groove them for sloping anytiers made of than wood or composition board



Cricks in inhid Implement on he soled with a paste made from matching Implement Silow the match to care waterproof concert. Allow the parch to care completely before walking on it



Hazor rack to the medicine calment as a step or bross or dant in bent to the over a stable to a stable

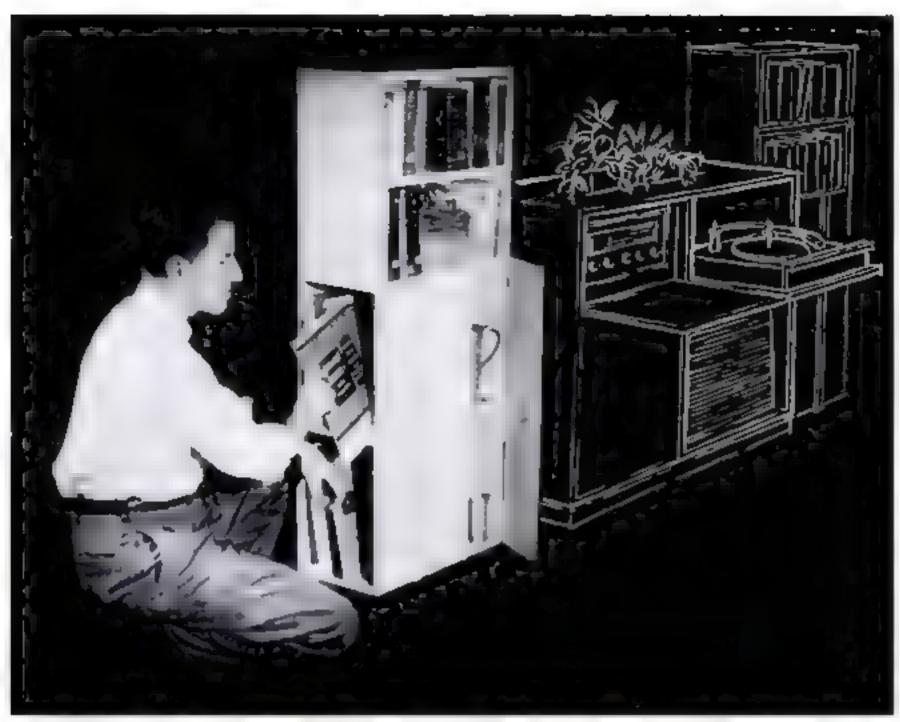


A hedside signal hell can be made by no intra an old alarms clock bell on a wooden base. Attach it to the wood with a netal bracket and it will sound off with a present 2 is when tipped with a spoon.



A bushel of small toys can be store as a busiel basket. A circle of plywheat cut and busiel makes a cover baster it to the run of the basket with this angle brackets. A brill the paint a trial will a peal to the suidlers.

276 POPULAR SCIENCE



Singly or in pairs, these cabinets provide three kinds of storage in very little floor spare.

# How to Store Your Records in Bookshelf Space

Easy to build, this wall-hugging cabinet holds your albums sideways, leaving room for reading matter and a cupboard.

### By Robert Gorman

THEY say long-playing records save a lot of space, but they did nothing to shrink my old record cabinet. Although thinner, LP albums are just as high and deep as old-fashioned platter packets. So it first seemed that new cabinets would have to be as big as the old.

But the ones I built take advantage of the shinness of the new albums. These cabinets store full-size disks in half the usual space—parallel to the wall instead of at right angles. This leaves space for tall articles like pitchers or big reference books.

My cabinet occupies otherwise useless space in a vestibule between two doors. But similar units can be used in numerous ways. They need only be accessible from one end and one side. In building a pair, don't forget that most arrangements will call for one right- and one left-hand unit

my two-stacker, in which the two cabinets are identical, is the exception.

To fit my wall space, the cabinets were built to a width of 20", and all dimensions shown are based on this. Of course, units can be made wider or narrower to suit your needs. The minimum width of the

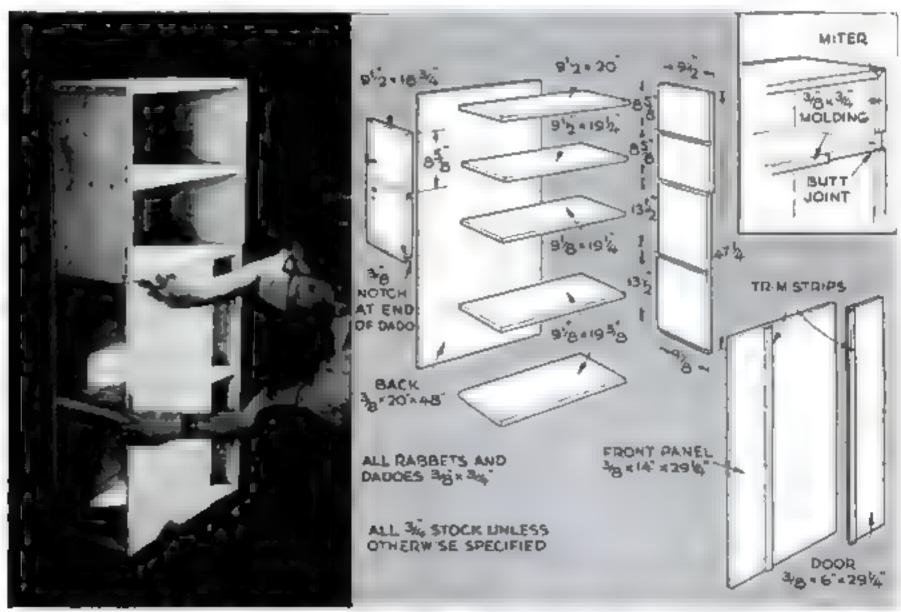
record space (parallel to the wall, or as measured from the open side) is 14"; any extra width can be used for the cupboard.

The cabinet can be a hammer-and-saw affair, with glued and screwed butt joints, or a circular-saw job with rabbeted and dadoed joints. Sides and shelves are cut



Wibt soasps may have warped enough to be hard to push into the dadoes. Fit can be eased by paring tiny chuntfers along the shelf ends with a chizel as above. Pressed home, warped shelves will be flattened by the dadoes.

MARK OFF screw holes with a cardboard template hid in the dadoes. Then drill clearance size for screws from inside. For butt joints, nurk centerline and spot the holes along it. Countersink holes from outside.



APPLY GLUE to joints and assemble with 1½"-10 wood screws. To align butt joints, clamp or tack strips inside, ¾" from centerlines. Mount the back also before joints set. Attach front temporarily with two screws.

THESE SIZES make a 20"-wide cabinet. For simpler butt-joint construction (inset above) cut second and third shelves 18½", fourth and bottom 19¾" long. Molding brings bookshelf section flush with panel below.

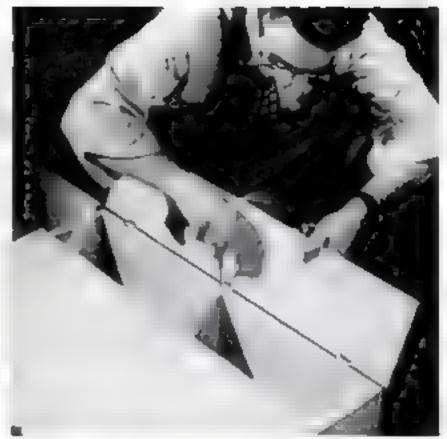


TALL AND TRIM, these two stacked units make good use of odd space between doors, are essier to build than a single high one.

from one-by-10 lumber (which measures X" by 9%" as it comes from the yard). Front and back are X" plywood, the dimensions shown taking advantage of the standard 48" panel size.

My bookshelves are spaced only 8%" apart, which is on the skimpy side for tall volumes. You can boost this a bit by stealing %" from each record compartment; a height of 13" is ample for these, and will maintain the over-all height at 48".

After assembling the cabinets with glue and countersunk screws, I covered the screw heads with plastic composition wood. The wood was sealed with thin shellac, followed by an undercoat and an enamel finish.



DOOR for closed section is cut from same 20"-wide piece as front panel. Chisel three gains (shallow notches) in cabinet side to full thickness of ½"-by-1" butt langes. Screw hinges to inside of door without recessing. If gains are correct depth, door will close flush. Trim strip conceals door gap.



friction catch goes under third shelf, if front panel is mounted only temporarily at first, it can be removed after joints set for installation of catch (above, cabinet is laid flat). Remount panel with glue and screws.



### Spring Strip Locks Come-Apart Hinges

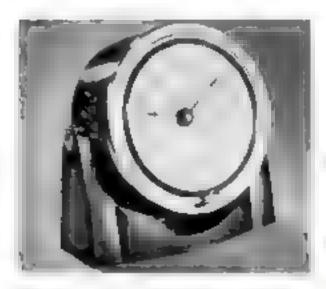
Costly damage can result if separable hinges like those on typewriter cases and portable radios come apart at the wrong time. A springy metal strip, attached with two screws to either case or lid, prevents accidental separation. Mount it to project past the hinge member attached to the other section. To slip the hinge, either press down or pull out the strip until it clears.—Walter E. Burton, Akron

# Here's a family project that's good for a lifetime

Developing—Printing—Enlorging! Here's much more than just another hobby for dad, or a pastime for junior. Here is a project for the whole family. A project whose rewards in pictures are good for a lifetime. You don't even need a darkroom for developing and printing. And enlarging will be one of the most satisfying activities you've ever tried. Here is some moderately priced Kodak equipment. Your Kodak dealer will be glad to show you more. He has all the latest dope and "doings" for beginners and experts.



A complete unlarger for only \$57.50. Kodak Hobbyist Enlarger comes complete with 1/6.3 lens. "Cold" light protects negatives. New-design lamp house insures specking enlargements up to 7 times. Easy-load, rotary, glassless negative carrier. Easel extra.



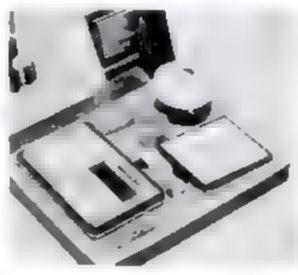
Times your work. Kodak Timer covers all intervals up to 60 minutes. Spring-wound; has both minute and second hands. Can be stopped and restarted without resetting hands. Special feature: handy tilting base, \$7.95.



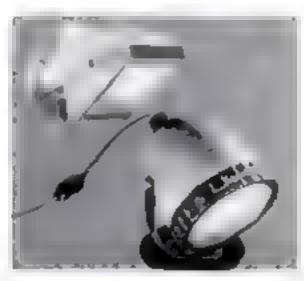
Mokes superb solon-quality prints. Kodak Flurolite Enlarger has integrating sphere light source for even illumination plus unusual printing speed and contrast. Focuses and elevates simultaneously. Lighttight paper-atorage base, \$99.50, without lens and easel



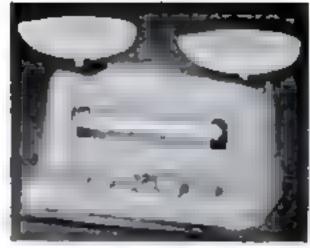
Washes Sim or prints automaticmby. Kodak Automatic Tray Siphon converts an ordinary tray into effective washer. Attaches to water tap. Water is siphoned out at same speed it enters. Wonderful for kitchen or bathroom, \$4.50.



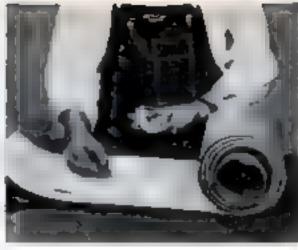
Everything you need for \$9.75. Kodacraft Photo-Lab Outfit contains basic essentials for developing and printing pictures. Includes rocker-type trays, roll-film tank, printing frame, printing paper, thermometer. Comes complete with illustrated instructions.



Protect light-sansitive materials.
Kodak 2-Way Safelamp (left)
swivels on socket for direct or indirect lighting. Second filter (extra)
allows 2-way light. \$4.50. Kodak
Adjustable Safelight Lamp (right)
attaches almost anywhere. \$8.75.



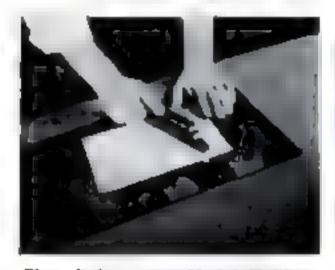
Accurate weight scale. Kodak Chemical Scale weighs up to 3% ounces or 175 grains (avoirdupois), or 130 grams (metric). Chemicalresistant housing. Heir-lined window makes easy reading. \$14.50.



Dries prints without carling. Kodak Blotter Roll with corrugated backing allows free circulation of air for rapid drying. Capacity, 80 prints of average size. 6 feet long, 11 ½ inches wide, \$2.88.



For contact printing. Kodecraft Printing Frame includes glass plate, mask for 9 popular negative sizes. Accepts paper up to 4 ½ × 5 ½ inches. Corner loading assures accurate positioning, \$1.65.



Zips of the water. Kodak Rubber Squeegee quickly removes superfluous water from flat surfaces. Ideal for quality ferrotyping, or Kodak Dye Transfer Process. 10-inch blade, \$3.75



3-in-1 funnel. Kodek Combination Funnel is made in two plastic sections. Can be used 3 ways as illustrated. Largest intake diameter, 5 inches. 2-inch and 34-inch spouts. \$.85.

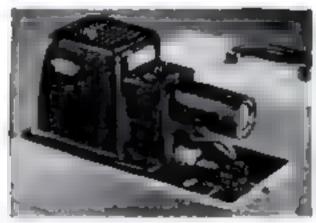


Easy rell-film developing. Kodacraft Roll-Film Tank can be used in lighted rooms (after loading). Faster drying "apron" method allows immediate development of successive rolls. \$2.53.

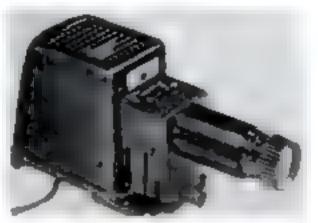


## Another good friend of the family— KODACHROME SLIDES

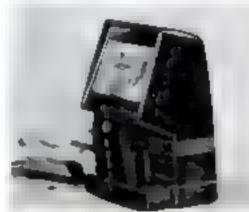
For an evening of thrills, you can't beat beautiful Kodachrome slides in glorious full color. Show them with one of the fine-quality Kodaslide projectors or viewers described below. Their optical systems help project your slides sharper and brighter, making every colorful detail stand out.



inexpensive fen-tooled projector.
Kodaslide Highlux III Projector.
300 watts. Brilliant optical system.
Built in its case. \$56.50. Highlux II (no Ian) is only \$36.50.

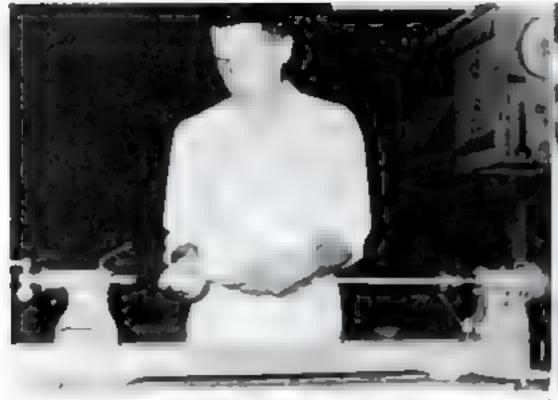


Rock-bottom price. Kodaslide Merit Projector features slidefeeding in top, prevents jarring. 5-inch #/3.5 lens. 150-watt lamp. 10-foot cord. \$26.10.



Show sildes in lighted reams. Kodashde Table Viewer 4X combines screen and projector in one convenient unit. It enlarges color slides 4 times, \$37.50.

Your Kodak dealer will be glad to demonstrate this equipment for you. Make him headquarters for all your photo needs.



1 \$AND DOWS! ROD TO SIZE. Spin it slowly—one end chucked, other end held loosely in hand—against sand-paper. Portable drill in bench vise will substitute for tathe, Check dumeter often by putting rod in test hole,



2 CUT GLUE SLOT by driving rod through jig with a dowel-sized hole into which point of screw projects from side.

# How to Make Dowel Pins

DOWEL pins are an old, old fastening for wood joints—and still one of the best. They are simple, adaptable and very strong. Craftsmen prefer them particularly for joining boards for a table top, reinforcing miter joints and attaching aprons to tables. You can buy dowel pins ready-made, but it's easy to make your own exactly the size you need.

Dovel rods—you can buy them at most hardware stores and lumberyards—are the raw material. Select a diameter roughly half the thickness of the stock to be joined and make the pins six times longer than their diameters. A close fit makes a better joint. The receiving holes should be about %" deeper than the length of the pins to allow a space for surplus glue.—Leo F. Bowler Jr., San Bernardino, Calif.

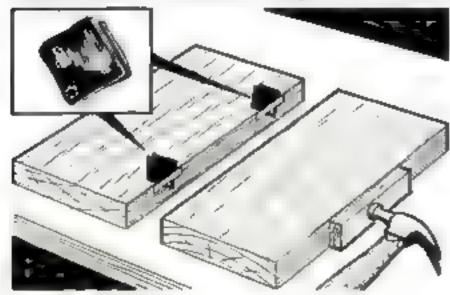


2 CHAMFER THE ENDS for easier insertion I after pins have been cut to proper length. A power sander does a fast job but it can also be done easily by hand with a rasp.



4 FINISHED COWEL PIN looks like this. Fulllength glue slot allows air to escape when joint is assembled. Pin should fit snugly, yet slide in without excessive pressure.

### **BB Shot in Carbon Paper Locates Points for Dowels**

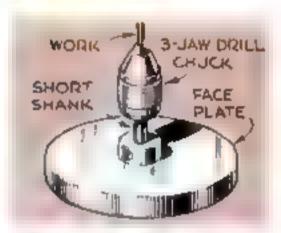


Points for drilling dowel holes to mate pieces of wood can be marked quickly and accurately by folding a sheet of carbon paper, carbon side out, and dropping in a small ball bearing or BB shot. Line up the pieces to be doweled, slip the paper between them and tap them together with a hammer. The carbon will mark both pieces at points exactly opposite each other for drilling the matching holes.—Mrs. John B. Higgins, Seattle.

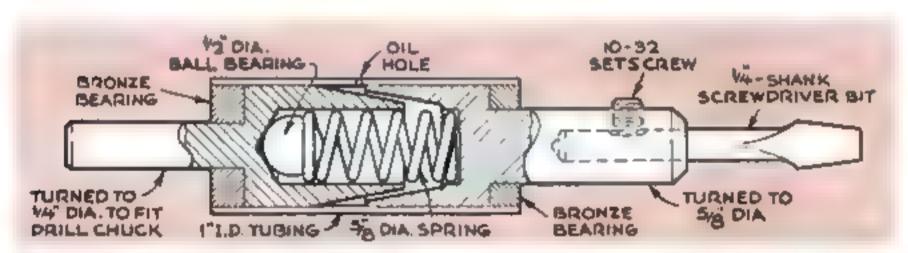


Surface Gauge Holds Magnifler. You can do delicate work with both hands if you mount a magnifying glass on a thin rod of the same diameter as the scriber of your surface gauge. The rod can then be held in the surface-gauge clamp and the glass adjusted to any height or degree of tilt. The base of the gauge provides a solid support for the magnifier. When not in use, the glass can be kept dust-free in a box cut from a covered tin can.

# NEW Shop Ideas



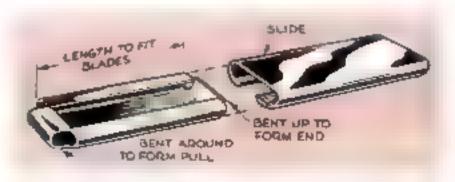
Chuck Doubles as Vise. Small work, rod or hexagon stock can be held vertically in a vise assembled from a drill chuck and lathe faceplate. The faceplate provides a broad, flat base for the chuck which is fitted to it by a short length of threaded rod.—Howard E. Moody, Upper Jay, N. Y.



Drill Attachment Orives Screws. Your electric drill will drive screws with this friction attachment. Mating tapers housed in aluminum tubing are held apart by a compression spring. Light pressure forces the rotating taper held in the drill chuck against the stationary taper that holds the screw-driver bit. A friction-clutch action results,

Curtain Rod Makes Small Drawers. Short lengths of telescoping curtain rod make handy under-the-bench drawers for jigsaw blades, lathe bits or drills. Tack the outer part of the rod to the underside of the bench to serve as a slide. Bend up the ends of the inner part to form the drawer.

driving the screw home. Slipping the tapers under light pressure drives the screw as slowly as desired. Turn the tapered parts from 1" cold-rolled rod, setting the lathe compound at 5°. Then slide the parts complete with spring and ball into the tubing and press the bronze bearings into the tubing ends.—M. Wittner, Brooklyn, N. Y.



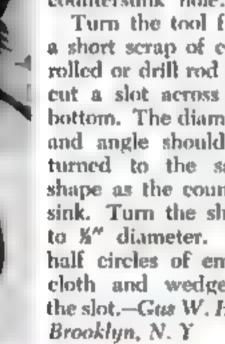


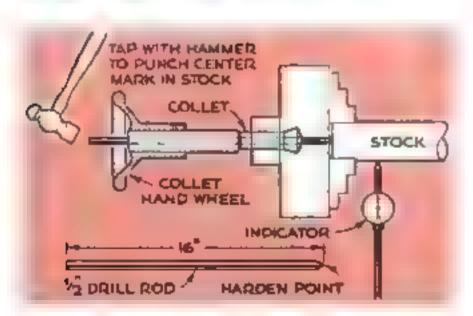
Cover Protects Motor. A sheet-metal box will keep dust and metal chips out of the vent holes in a power-tool motor, prolonging its life. Attach the box to the motor stand or other convenient stationary part and cut an oversize hole for the pulley shaft.-Floyd McGuckin, Ridgewood, N. J.

**Grinder Smooths Countersinks.** Seldom does a smooth finish result from a countersink bit. This grinder tool, with its easily replaceable, emery-cloth working edge, will remove the chatter marks and leave a pol-

ished edge on the countersunk hole.

Turn the tool from a short scrap of coldrolled or drill rod and cut a slot across the bottom. The diameter and angle should be turned to the same shape as the countersink. Turn the shank to X" diameter. Cut half circles of emery cloth and wedge in the slot.—Gus W. Hall. Brooklyn, N. Y.





Oil Forces Bushings Out of Blind Holes.

Hydraulic pressure can pinch-hit for pry bars, cold chisels, punches or other tools usually needed to remove a worn bushing from a blind hole.

Fill the bearing hole about one-third full with a heavy oil or light grease and

drive in a steel plunger, turned to a minus one or two-thousandths fit. Hammer blows will force the oil under the bushing and lift it out. Stubborn bushings may require the pressure of an arbor press, but the result is the same -something must give and it must be the bushing.—F. Strasser, Santiago, Chile.





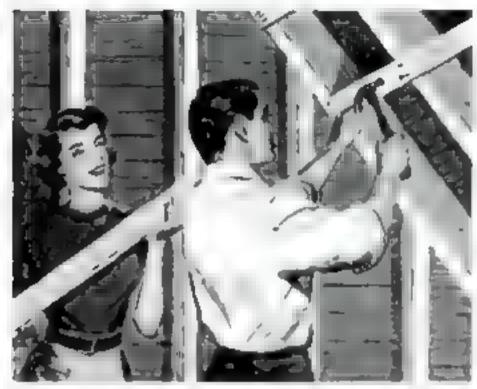
Taps and Drills Packed in Sets, Keep your taps and matching drills together in handy individual cases to save looking up the sizes needed for drilling and tapping holes.

Make the cases from blocks of wood-pine will do. Drill three holes for the tap and drills, then drill through the side for the rubber band that holds the cap tightly in place. Glue a dowel into the cap to fit the center hole. Drills can be taken out by turning the cover.—John M. Avery, Dexter, N. Y.

Centerpunching Long Stock. Shafts or lengths of rod that must be accurately centerpunched on their ends can be hit "on the nose" with this setup.

Mount the work in the 4-jaw chuck and center it with a dial indicator, the free end supported by the tailstock. Pass the long centerpunch (%" drill rod) through a %" collet previously set in the lathe spindle. The punch will center itself and a sharp tap with a hammer will mark the work.-W. B. Goodrich, Somerville, Mass.

# It's easy, inexpensive to fix up your attic with Armstrong's Temlok



1. You can turn a dark, dusty attle into a cheerful bedroom in a few days with Temlok Tile and Plank. Temlok it a durable, inexpensive wood fiber material that builds, decorates, and insulates. First, nail 1"x 3" furning on 12" centers to all framing members.



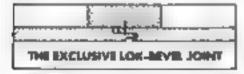
2. Wells go up fest with Temlok Plank. The smooth, long planks are easy to handle. Temlok's exclusive Lok-Bevel Joint makes nailing or stapling extra fast. Planks come pre-finished in "Suntan Blend," a random coloring. Sizer: 8", 12", 16" wide; up to 12' long.



3. Coilings no problem with Temlek Tile. Comes factory painted in Snow White and Light Ivory—gives ceiling high light reflection. Lok-Bevel Joint hides all nails and staples, almost anyone can do a neat-looking job in a short time. Sizes 12"x 12", 16"x16", 16"x 32".



4. Job done in a day or two. Once Temlok is up, move in the furniture, and you'll have a comfortable attic room at remarkably low cost. Your family will be after you to fix up the basement with Temlok next. Get Temlok at your lumber or building supply dealer.



For Free Socklet, "New Ways to Remodel Your Home," write Armstrong Cork Company, 3701 Washington Avenue, Lancaster, Pennsylvania.



Monowall<sup>8</sup>

Cushiontone®

Insulating Wool

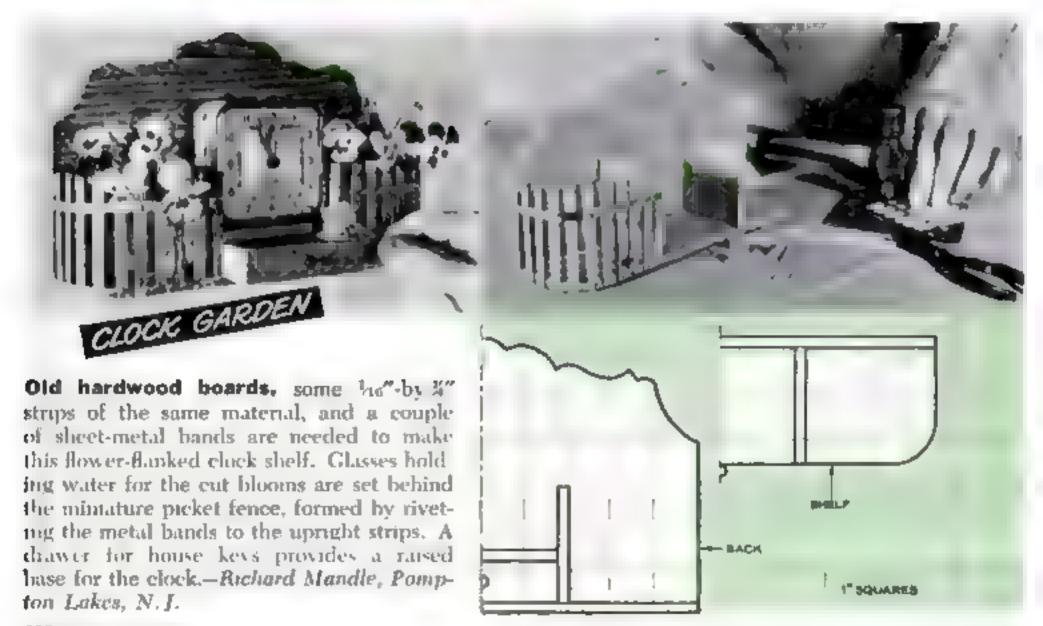
MSTRONG'S TEML

**Hordboords** 

Counter-top Cament



No butts about this ash tray. Rubber-cement the old goat's paper likeness on sheet brass. Cut the outline with a jeweler's saw and smooth all edges with a fine file. Solder the round head of a No. 6-32 bolt in the notch in the bottom and pass it through a hole drilled in the center of a metal tray or china saucer, where it's secured with a thin nut. For china, drill hole with a K" brass rod, rotated in a little pool of No. 150 sibcon carbide grains mixed with turpentine.—Walter E. Burton, Akron.



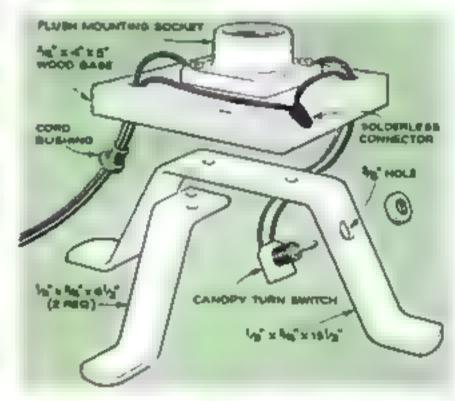


LEGS ARE BENT from ","-hy-24" strip aluminum, two from a single length and two from separate pieces. Drill a hole in one leg for a canopy switch.

The colorful shade of this lamp comes ready-made as a 12"-by-18" bamboo place mat. From %" wood, cut a 4"-by-5" block, around which the mat just fits snugly. Dall a corner hole for the lamp cord and another opposite for the switch leads. Fasten a flush-mounting socket in the center. Dall two holes in each leg piece for %" wood screws. Then screw on the legs and complete the wiring.

Cut 2" from the width of the mat. Glue it around the base, bend a strip of light aluminum molding or linoleum binding around over it, and secure with escutcheon pins. The the ends of the mat together with a strong thread midway and at the top. Then shape a second piece of molding like the first. Cement it around the top of the shade. Use only small bulbs that cannot lough the shade.

ENOUGH DONT to brighten your TV area without washing out the picture is provided by a 25- or 40-watt bulb. Striped shadows are cast by unfrosted bulb, which requires a frosted acctate shield inside shade. A frosted bulb will east a soft glow.



JEWEL BOX

A short piece of copper stack pipe of 8½" diameter, left over from a phumbing 100, provided the inspiration and center section for this project. You can quickly fashion the square mahogany base and octagonal lid which convert it into a handsome lewel box. Rout shallow recesses in each of the hardwood members to receive the pipe, and glue suede or felt in them to serve as cushioning. Mount a knob on the lid – Clifton Morris, Lubbock, Tex.





#### **Bearings Banish Swing Squeaks**

If the noise of rusty chains on a backyard swing jangles your nerves, here's a cure. Take two eyebolts. Add two ballbearing rings that press nicely into the eyelets. For the shackles, use h" flat stock, washers and stove bolts. Bolt one end of the shackles to the bearing raceways and the other to the chains. Pack well with grease.—Karl Greif, Vestal, N. Y.

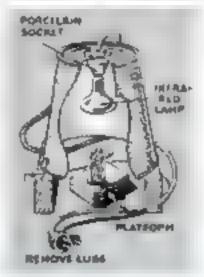
### Stainproofing Clothespins

STAINS on clothing caused by dirty clothespins can be prevented this way. Wire open the jaws on each pin, then dip the ends in white-rubber tire coating



and let dry. The smooth rubber finish will seal the wood pores and keep dirt from accumulating.—Ken Murray, Colon, Mich.

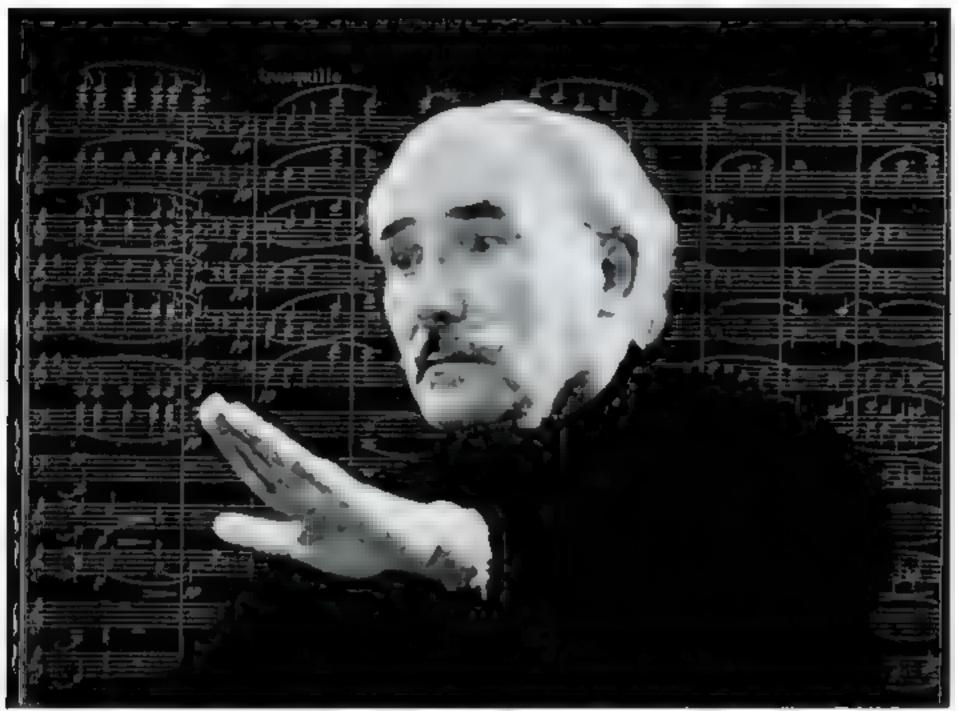
### **Bucket Makes Drying Oven**



AN OLD pail will provide you with an oven in a hurry when you need it for drying freshly painted or water-soaked small parts. Use a 10-quart size. Cut off the handle lugs and cut a hole in the bottom to hold a porcelain socket. An infrared

bulb mounted in the socket will soon dry parts laid on the wood platform below it.— Harry J. Miller, Sarasota, Fla.





Arture Toscanini conducting "Death and Transfiguration," Opus 24, by Richard Strause

# RCA High Fidelity brings you every musical note!

RCA Victor High Fidelity is the result of a half century of leadership in recorded music, in phonograph research and in the development of radio and motion picture sound equipment. It is a great new dimension in sound created by the perfect union of recorded music and the phonograph.

A genuine high fidelity instrument re-creates the full range of tones and overtones of the original composition—exactly as the composer intended.

"Victrola" phonographs, Victor rec-

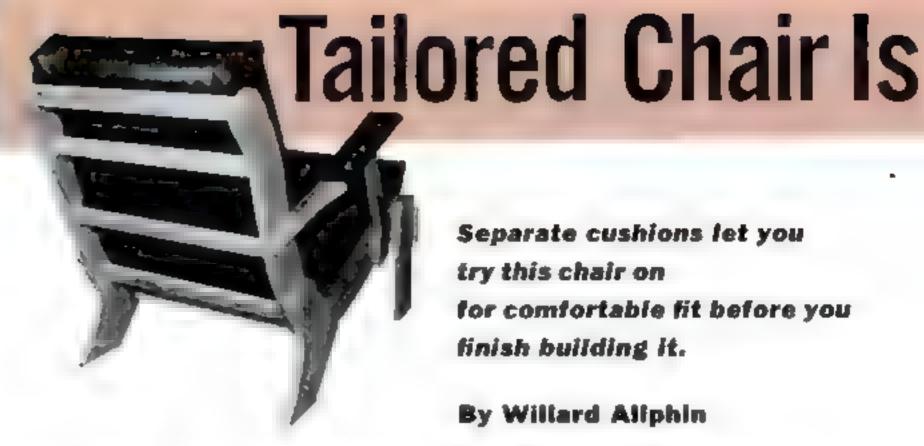
ords, and "intermatched" high fidelity equipments for those who want to assemble their own units—all are designed to work perfectly together to bring all of the brilliance of the original performance into the home.

The nation-wide interest in high fidelity reflects the public's growing taste for the highest quality in recorded and broadcast music. Developments by RCA scientists and engineers now make it possible for you to enjoy this new musical experience.



® RADIO CORPORATION OF AMERICA

World leader in radio - first in television



Separate cushions let you try this chair on for comfortable fit before you finish building it.

### By Willard Aliphin

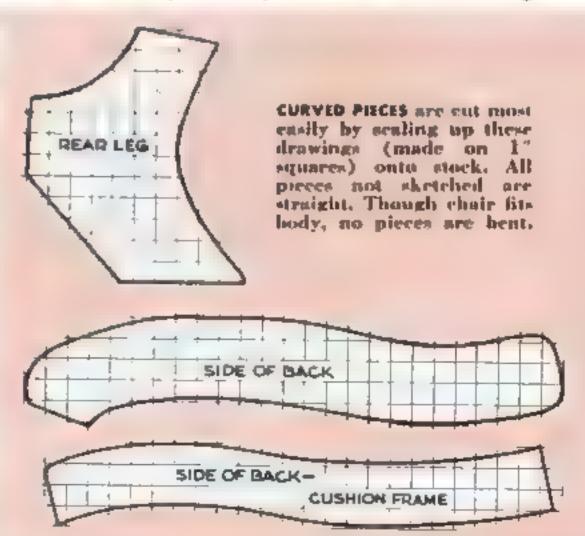
LIKE a tailor-made suit, the most comfortable chair in the world is one proportioned to fit you-not some statistically average spook dreamed up by a furniture designer.

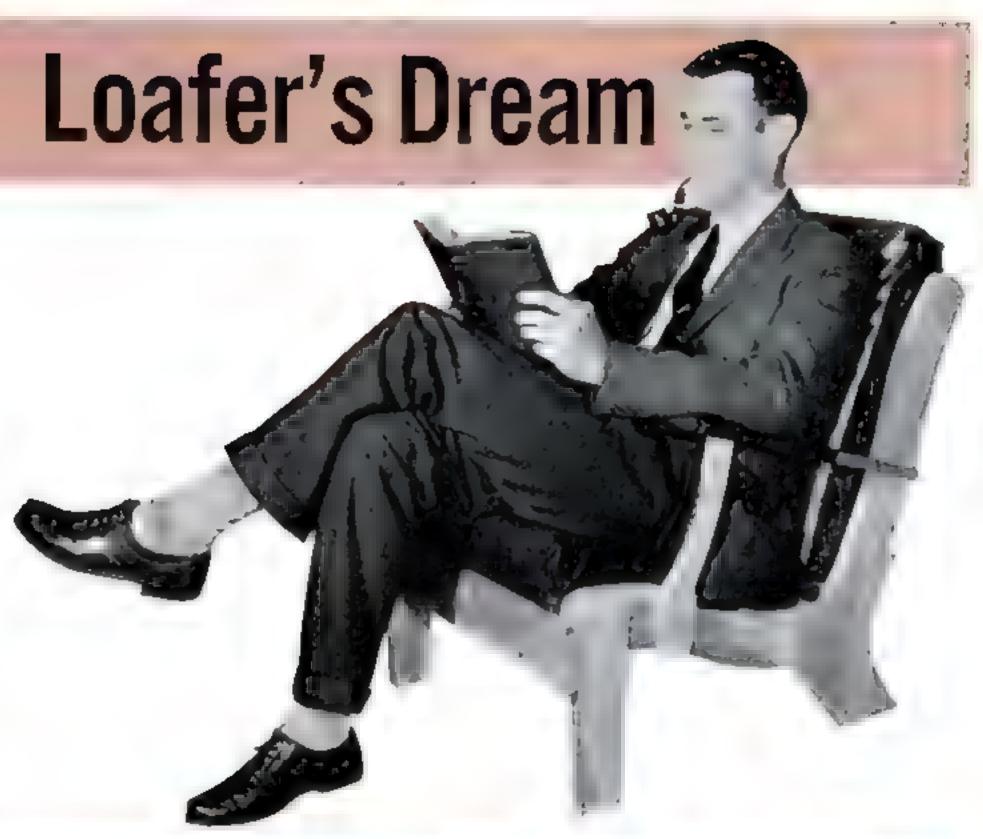
The cushioned seat and back of this formfitting chair were built first. Temporary legs and back bracing were then screwed on so that various leg lengths and tilt angles could be tested. These were experimentally modified until the chair felt just right. We even had a few "fittings" several days apart to be sure the mock-up was correct. Only after the chair had passed this trial was the frame "finalized." The dimensions given are those for a chair that suits a tall, fairly slim person; perhaps you'd want to modify them a bit if nature made you differently.

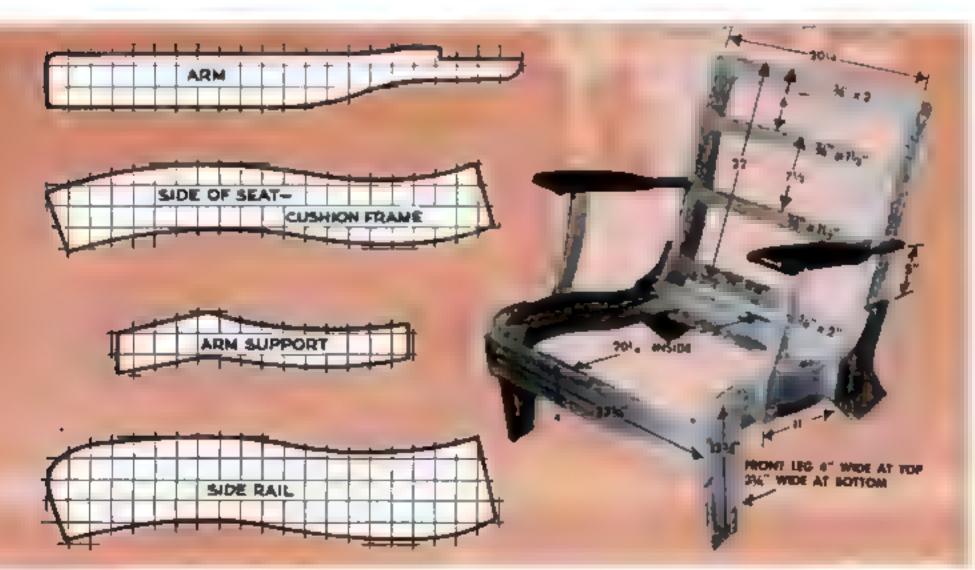
There are other virtues to the design: It will harmonize with either a traditional or modern interior. It can be built with hand tools, although a band- or jigsaw would certainly help. Even though the chair is contoured, no headachy wood bending is necessary. Making the cushions separate rather than integral may seem old-fashioned but it has advantages-you can handle the upholstery easier, you can do the trial-fitting

#### LIST OF MATERIALS

- 2 pieces 1" by 10" by 10" hardwood
- 8' of 1" by 8" hardwood
- 15 yards 50"-wide upholstery fahric
- 1 piece 1" by 21" by 21" foam rubber
- I piece 1" by 21" by 26" foam rubber
- 2 yards mosto
- 2 yards burlap
- 15 yards 3%" upholsterer's webbing
- 2 yards 1" cotton felt
- 4 lb. upholsterer's moss
- 10 yards linen thread
- 5 dozen 1%" No. 10 flathead wood serews
- 3 dozen 1%" No. 10 flathead wood serews
- 2 boxes No. 8 cut tacks
- 2 boxes No. 6 cut tacks
- 1 box No. 3 gimp tacks







trick much better, and you can improvise summer slip covers very simply just by wrapping cloth around a cushion and pinning it behind.

Frames first. Start by making the backand seat-cushion frames, and upholster them—at least up to the muslin-cover stage -so you can make a mock-up to try proportions. Use any hardwood that will accept tacks. (I cannibalized a mahogany table.)

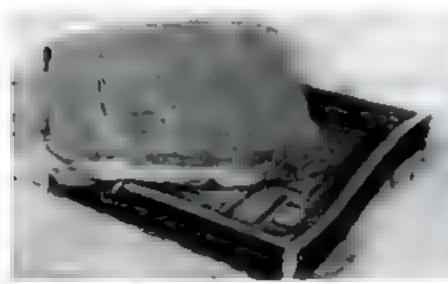
The shape of the slightly curved sides of each frame is shown in the drawing; the crosspieces are of course straight. Make the seat-cushion frame 18%" square, inside, and

# How to Upholster Your Loafing Chair



1 TACK 31/2" WESSING arrows bottom of each frame. Fold webbing under at the start, and drive in five No. 8 tacks. Stretch with webbing stretcher, and drive three tacks.

2 CUT OFF webbing about 1" long, fold over and drive in two more tacks between the previous three. When webbing is complete in one direction, weave in transverse strips.



3 ASSEMBLED SPRING SETS, obtainable at upbiolatery-supply stores, are handler than tying off springs yourself. A 25-coil unit goes in seat, a 30-coil unit in the back.



4 DROP SPRING UNIT IN FRAME and cover with burlap panel. Fold edge under and secure with No. 6 tacks. In this and most operations, put first tack in middle and work out.



5 A STUFFED ROLL goes on front of seat, top of back. Tack on a 3" burlap strip, add upholsterer's moss, roll back and tack again. Knitting needle helps break up lumps.



6 BRIDLED EDGE is term for hig twine loops stitched at sides. The purpose is to keep moss padding from working away from edge. Fluff out moss and tuck under the loops.



7 COVER CENTER with more most that has been fluffed out, building up slightly above the height of bridled edges. Big stitches of twine hold most to burlap underneath.

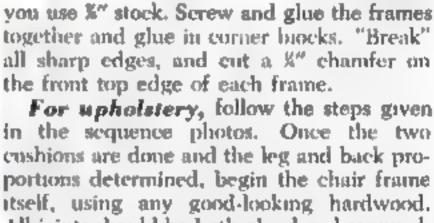


O corrow feet 1" thick goes over the moss, of and is in turn covered with muslin. Use No. 6 tacks to hold muslin to bottom of frame. Now cushions are ready for trial.

the back 18%" by 21%", juside, assuming

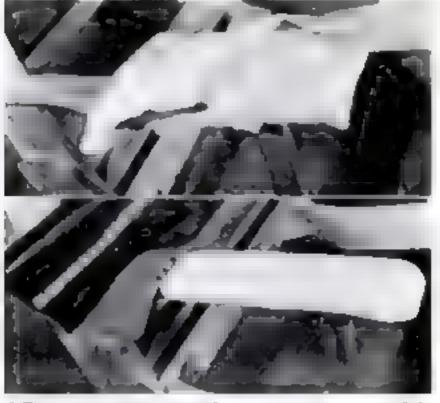


J FINAL COVERING is plastic leatherette over J foam-rubber pad. Attack to bottom of frame with No. 8 tacks. At corners, make tuck held by No. 3 gimp or ornamental tacks.



portions determined, begin the chair frame itself, using any good-looking hardwood. All joints should be both glued and screwed, using No. 10 flathead screws in holes that are counterbored and plugged with identical wood. Fasten the front legs to the side rails first so that the two can be sanded to a flush upper edge. You'll find it more convenient to make up each side complete before adding the cross members. Corner blocks under the seat help support it and also stiffen the structure

I used oil- and wax-finished light birch, with maroon leatherette upholstery. Although the chair looks fine, its strong point is something else; pure unalloyed comfort—a chair for expert loafing.



10 UPHOLSTER ARMS by covering cotton felt with muslin, tacking underneath (upper photo). To conceal tacks in final covering, start by tacking through strip of cardboard (lower photo). Then pull material forward and around and tack underneath.

### Small Hole Neatly Bored Larger with Help of Dowel

To avoir chewing up the surface of wood when a remodeling job calls for a large hole in a place already occupied by a small hole, try this trick. Plug the old small hole with a tight-fitting peg or dowel. Then set the screw of the larger bit into the middle of the plug and bore ahead.—Thomas P. Ramirez, Fond du Lac, Wis.

#### You Can Turn Metal Into Pleasure or Profit

[Continued from page 221]

diesel power plants you can build from eastings.

Most every garage of any size has a bench lathe and uses it plenty. If you are a hotrod or sports-car man, you'll find it handy for making special jets, dressing commutators, reboring con rods and so forth.

Money from a lathe. As the experience of my banker friend indicates, a lot of guys all over the country are making their lathes pay off. Many began in the war at tiny subsub-sub-subcontract jobs and have kept it up ever since. There's also a continuing field for one-man lathe shops in turning out scientific and hobby equipment.

One man I know turns out special lens mounts for camera funs. Another invented and makes a rotating jig for holding insects for entomologists. Another makes de luxe handles for fishing rods.

You should be realistic here, of course. Just because a lathe pays off for some guys in some circumstances, it doesn't necessarily follow that it will for you, or that you'll even want it to. I've noticed, though, that nine times out of 10, the profit-making angle grows out of running a lathe just for fun.

How to start. One big block in the way is that many people think machining is an obscure and difficult art, too tough for them to tackle. The best way to dispel that goofy notion is to buy a book on basic lathe work.

You can get standard texts in most bookstores, or manuals from the manufacturers.

If you go over it carefully, you'll soon discover why you can run a lathe. Basically it is a very simple mechanism. You don't need any experience to run it. Just take it slow and easy, reading up on each operation before you begin.

Sure, you'll make a few blunders at first—at least, I did. But unless you fall sound asleep, you won't hurt much more than your work and your pride. A lathe works at modest speeds, and the tool is fed automatically, or by controls inches away from

the cutting edge.

My feeling is that you will do best to begin with a 9" or 10" light bench lathe. It is very seldom that you use its full capacity, but when you need it—brother, you need it bad. A smaller one doesn't cost very much less. And bench lathes of this size are standard equipment, so when you want to trade it in the value will stay up.

One or two other power tools are very useful adjuncts to a lathe, notably a drill

press and a bench grinder.

If you do take the plunge for a lathe, I'll make a prediction: you've bought yourself about the greatest source of enjoyment for the money that you could possibly buy. You'll discover skills you never dreamed of, and days and years of fun.

### PIPE DIMENSIONS

Threads Par Loch	27	9	Ŷ	朮	র	ā	吉	<b>†</b> 11	411	-	•	•	•	40	•	10	-	•		49		49	*	•	•	•
detrail Outside Dieseter	Soft o	0.540	529.0	0.64.0	1,050	1.315	1,660	1,900	2,375	\$1918	3,500	000°4	4.500	5,000	5.563	6.625	7,685	4,625	6,625	9.625	10,750	10.750	10.750	11.750	12.750	12,750
actual Inside Diameter	6,259	0.34	0,493	D.628	\$50°0	1.049	24,380	1.610	2,067	2,469	3.068	3.5kB	920*4	\$05*4	5,047	6,065	1,023	6,072	7.981	6.943	10,194	10.1,36	10,020	11.000	12.090	12.000
Hominal Edse	1/1	\$	2	\$	×	-	*	含	~	增	n	大		3	w	9	P-		-	<b>a</b> -	10	10	10	#	2	я

FOR YOUR POPULAR SCIENCE MONTHLY INFORMATION FILE

NOTE: Dimensions above, in inches, are for standard steel and wronght-fron pipe.



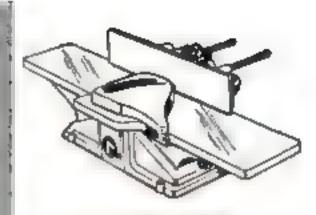
20" JIG SAW

With completely built-in motor, Table tilts to 45°, Built in blower. Blade turns to rip. Available with mitre gauge and rip fence...



#### 10" TILTING TABLE BAND SAW

All east tool of rugged aluminum alloy 10 by 10 table top. Has excellent locking mechanism.....



#### 4" JOINTER-PLANER

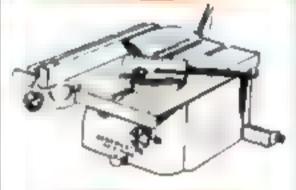
Professional model with latest cutting head. Cuts 1/2 inch deep and 6 inches wide. Removable guard.,



#### 12" DRILL PRESS BENCH MODEL

Equipped with Jacobs Chucks, three-spoke feed wheel. Shaper

attachmenta gygslable....



#### B" I IT NO ARBOR SAW

Heavy duty construction. Scaled-for-life ball bearings. Table size 13 by 16. Complete with mitte gauge and

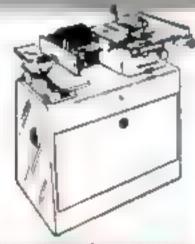
tip fence



#### 9 IN 1 UNIVERSAL TOOL

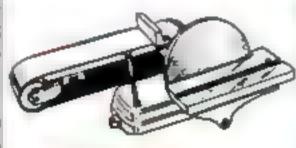
Has sturdy workbench stand. Adapts quickly to Circle Saw, Drill Press, Sander, Shaper, Router, Lathe, Jointer, Grinder, or Buffer, All in one tool.....

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#### **DUAL CIRCLE SAW-JOINTER**

New combination dual purpose tool, complete with motor that switches easily from one tool to other. Complete \$ with motor.....



#### COMBINATION

#### BELT AND DISC SANDER

Ruggedly constructed. Table tilts to 45°. Entire sander tilts to vertical position. Has belt tension knob and S lock.....

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# Care and Feeding of Engines BY S. P. CORP

#### FLIRTATIOUS SPEEDOMETER

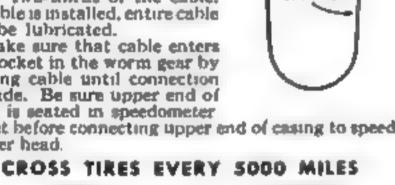
When your speedometer becomes nousy and waves at you, it's time to inspect the head and the cable. To test for tightness in the head, disconnect the cable casing up under the instrument panel and pull cable out of casing. Then insert upper end of cable back into the speedometer head and spin it between your thumb and finger. If cable turns hard, the head should be removed for internal repairs.

Next, inspect cable for breaks, worn spots, or kinks. Hold both ends of cable as shown and turn it slowly. A kinked cable will "flop" and you need a new one. Check casing carefully and replace it if distorted or broken. Remove any sharp bends. Before putting cable back in cas-ing, spread a thin layer of highlow temperature grease over the lower two-thirds of the cable. As cable is installed, entire cable will be lubricated.

Make sure that cable enters the socket in the worm gear by turning cable until connection is made. Be sure upper end of cable is seated in speedometer









Your tires will last longer if you cross them every 5000 miles, as shown above, to counteract the uneven wear which occurs when a tire is left on the same wheel continuously. As tires are rotated, remove any metal or foreign material imbedded in the treads. If treads are worn smooth, replace them for winter driving and thus reduce the danger of skidding. Be sure to have any cuts repaired, as water or dirt penetrating to the cords can cause rapid deterioration of the tire.

#### WRITE FOR FREE BOOKLET

"MORE POWER, Less Oil, Less Gas," is a free illus-



trated manual of car care which may save you a lot of money. It tells all about Sealed Power KromeX Full-Flow Ring Sets and the famous MD-50 Steel Oil Ring with the Full-Flow Spring, which does the best possible job of oil control, even in badly tapered and out-of-round bores. To get your free copy write a card to Sealed Power Corporation, Dept. H-1, Muskegon, Michigan,

#### You Can't Blow Your Horn in Memphis [(antinued from name 104]

more than any vehicle: it shot the decibel count up to 34.

Hence the wrath of the law falls upon horns. It falls especially on the ancient practice of summoning a date or a fishing companion from house to curb on the horn button. It also falls on those fancy double air horns which some auto enthusiasts like to mount on fenders. These are banned in Memphis, as are horns which play a tune.

#### Many Other Noises Banned

The city's basic ordinance is supplemented by numerous others. Bicycles may carry no siren or whistle. Hospital zones require a double dose of silence. Train whistles can be blown only briefly and only when state law requires it. Aircraft must fly at an altitude of at least 2,000 feet. Fireworks are absolutely banned.

A special ordinance makes it an offense to disturb public worship by noise or rude, profane discourse. The autoinspection law requires every car to be inspected three times a year, and motorists with faulty mufflers have to buy and install new ones before their cars get stickers.

Memphis is an Egyptian name meaning "place of good abode." Citizens of the Tennessee Memphis are proudly certain that they are living up to the name. The most noise they make is in proclaiming how quiet their city is.

#### The Easy Way

ONE of the greatest marksmen of the FBI was passing through a small town and everywhere he saw evidence of the most amazing shooting On trees, walks and on fences were numberless bull's-eyes with the bullet hole right in the center. He asked to meet the man who had done the shooting. It turned out to be the village idiot.

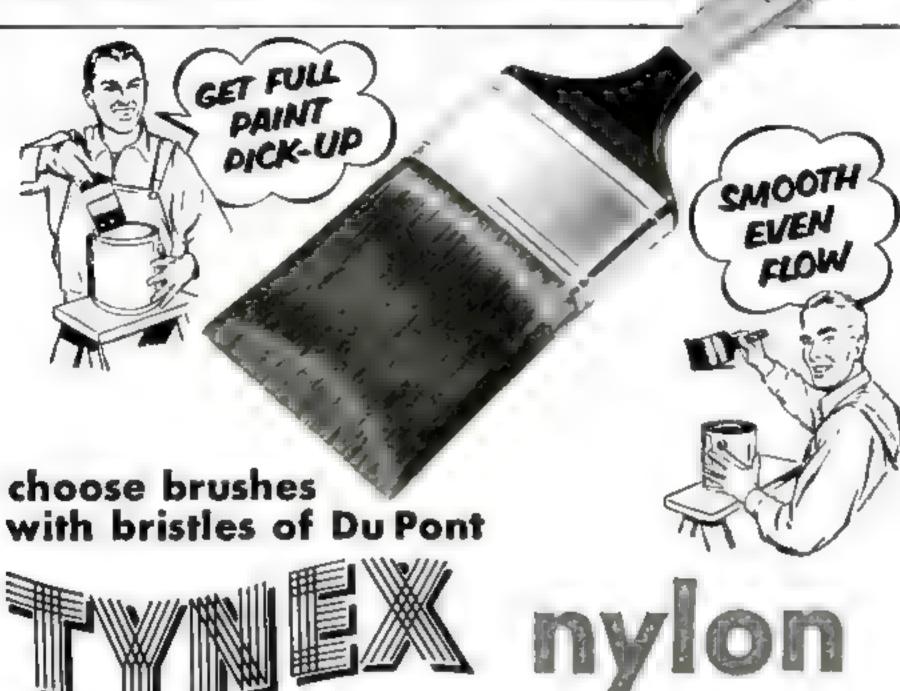
"This is the most wonderful marksmanship I have ever seen," said the FBI man, "How do

you do it?"

"Easy as pic," replied the village idiot, "I shoot first and draw the circles afterward."-The Kablegrom.

# Announcing TYNEX ... a new trade-mark for Du Pont nylon bristles





To assure you of highest-quality bristles when you buy paintbrushes, Du Pont has adopted the trade-mark "Tynex" for bristles of genuins Du Pont nylon.

"Tynex" nylon bristles help make painting easier and faster. Brushes with long, tapered, well-tipped "Tynex" bristles pick up a full load of paint... flow it on smoothly and evenly. Home painters know from experience that "Tynex" bristles are easy to clean with any commercial cleaner... won't break off... last three to five times as long as other types of bristles.

"Tynex" has been granted the Good Housekeeping Guarantee Seal. Leading brush manufacturers are now using the trademark "Tynex" to identify genuine Du Pont hylon bristles in all types of paintbrushes. So next time you buy brushes, look for the word "Tynex" on tags and brush handles. It's your guarantee of work-saving, long-lasting bristles of Du Pont hylon!



90 a 4



SETTER THINGS FOR BETTER LIVING



# ADJUSTS . . . UP and DOWN and SIDEWAYS

Stardtly built of heavygauge steel, electric arcwelded construction, Anished in baked enamel. the new two-way adjustable MORRISON power tool bench meets all requirements of the power tool user. Precision-engineered, easily assembled - no extra parts required - provisions made for rubber feet or casters. The most versatile and useful power tool bench ever designed.

### WRITE TODAY FOR CATALOG



#### IN TWO SIZES

MODEL 1424

#### Model 1424

Height from 24" to 33%" Width from: 14" to 24" Shipping weight: 36 lbs.

#### Medel 2448

Height from: 24" to 33%;"
Width from: 24" to 42"
Shipping weight: 46 lbs.

Sets of casters or rubber feet available at nominal cost.



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Please ship Marrison Adjustable Power Tool Bench Model 1424 (\$14.95)  Model 2443 (\$17.95)  I enclose cash, check or money order
☐ I anclose \$5.00 deposit, will pay balance and ship- ping cost C.O.D. In State of Ohio Add 3% Sales Tax
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CITY

# How to Keep Things Up [Continued from page 217]

to be used and the size of the hole to be drilled.

When you have a really heavy load to go on a frame wall, you must fasten hangers or brackets to the studs themselves.

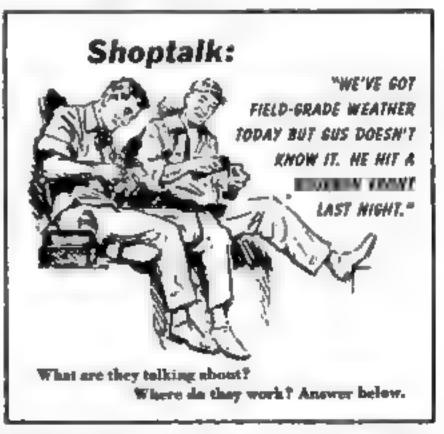
How to locate studs. Most builders place studs 16" from center to center. Some may use 12" centered studs. On inside partitions, stud spacing may be varied further, particularly when the wall material does not come in standard 48" widths. Here are some ways of finding them.

1. Tapping. Wrap a piece of thick cloth over the head of a light hammer and tap on the wall sharply in the area you want to drill. When you come to the stud, the tapping will sound duller.

 Nailheads. Examine the upper part of the baseboard for evidences of nailheads.
 If you can find any, they should have been driven into the studs.

3. Drilling. If you are erecting a permanent piece which will cover the wall, drill a horizontal line of holes about 1" apart until you hit a stud. The piece will hide them later

4. Baseboard. Carefully remove a section of baseboard below the area you want to drill. Usually the study will show. If they are covered with a wallboard, you can drill a series of holes below the baseboard top and locate the study.—Will Thomas, Buffalo, N. Y.



They're mechanics at an Air Force Base. Field-grade weather means clear with visibility unlimited but Gue is fogged in because he had a big night in the non-commissioned officers' club.

# Powerful May Jig Saw with Built-in Rotary Motor My 13



- Cuts 114" wood, 44" plywood metal, plastic, etc. -will even cut a 2x4"
- New ROCKER ACTION PRINCIPLE prevents blade whipping or bucking, eliminates breakage. This revolutionary improvement obsoletes old style blade tension spring, permits use of finest, fastest culting blades in pg saw history.
- Safe for children! Blade is completely guarded against finger injuries?
- 1-way blade holder saws any direction, inken any length stock! Table raises and lowers so you can use every tooth in the blade! Take 45".

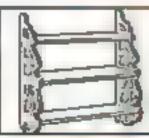
Here's jig saw magic to amaze you! Here's a powerful tool driven by a real rotary motor (not a vibrator) that cuts through wood as fast as you can feed it! Sturdy,

compact, and agile, it takes 90° turns at top speed, cuts the most intreate scrolls yet is rugged enough for major household repair jobs! Use it to make lawn furniture, valances, knicknacks, toys. It's ideal for adults, safe for children—an all-family tool! The new Dreniel Moto-Jig Saw is so superior to others anywhere near its price class that we challenge you to match it against others costing many dollars more. You'll agree it's the greatest value in Jig saw history!















Put, pend.

### ANOTHER LONG-TIME FAVORITE WITH CRAFTSMEN!

## DREMEL Electric MOTO-TOOL



FASTEST MOST POWERFUL TOOL IN ITS CLASS—Approx 27.000 r p m The original Pocket-Size Machine Shop. The most practical tool a man can own Indispensable for carving drilling grinding sharpening tools scissors, kitchen knives garden tools lown mower blades, etc. More versatile than a 'a' drill, lightweight (1) oz ) for bundreds of small jobs hanging pictures installing cabinet hardware, hardwood trim etc. Powerful 110 v. AC-DC motor. A precision tool widely used in Industry

Mode 2 Moto-Tool, 23 accessories High-Speed Wheel Cutters. Grinding Wheels Pollabers). Packed in sturdy hard. \$25.95 wood case. Mindel 1 Moto Tool
34 acressories (Steel
Culters Grinding
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Posts; vely the best hand grinder value on the market Thou sands of satisfied users. (With I emery wheal point)



SEE FOUR FAVORITE DEALEM: Invene Tours are not due before dealem exercitor of Popular conflormation and a directing a day may exhibit the house by granting to a special or a sold for a special conflormation of the payment of the property of the payment of the p

DREMEL MANUFACTURING CO. Dept. 124-A RACINE, WIS.



Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line — you'll find a style and model to do any job better.



THE PLIER DESIGN THAT OBSOLETES ALL OTHERS

CHAMPION GLARMENT TOOL CO. & MEADVILLE PA.

#### Gue Answers a Fire Alarm [Continued from page 196]

many, one extra gust of wind . . . the whole block was threatened.

First he unclamped the distributor cap and checked inside. The points were fine, the blade-spring intact, and the works moved freely without sticking.

"Your mechanic tried everything, Joe?"
"Yes. He couldn't find a thing, though."

#### Gus Hours the Thunder of Hooves

He made sure there were no air leaks around the intake manifold, that the fuel line was not spilling gas somewhere aft of the carburctor.

Gus stepped back and slapped at a spark on his neck in disgust. As he groped back through his mind for other ideas, he suddenly heard a bell. A bell growing louder and then the thunder of hooves.

He saw the men in the alley scatter and hug the sides of the buildings. And then came a sight the town hadn't seen in over 40 years—Sam Boise in all his glory, coming down the alley in the ancient fire wagon, whipping the horses into a last furious charge, and then the spark-shooting clatter of metal wheels, as he wrestled it to a stop. The firemen gaped as the old man spryly jumped to the ground.

#### Sam Mans the Spouting Hose

"All right, you young monkeys, hop to it—this ain't no wienie roast! Uncouple that hose on the truck tank and keep my tank full!" Sam Boise pulled the spouting hose to the doorway and began working his way in. A cheer went up.

There was no miracle in the way the old wagon came to life after all those years, not when you knew the loving soul of Sam Boise. It worked, and it worked well. The horses stood in quiet discipline as if the old brigade had never died.

Joe Insley came back to see how things were going. "Found anything, Gus?"

"Not yet." He winced. "The way this darned smoke gets in your eyes! I don't know what to say, Joe. I've checked everything I possibly can."

He started up the engine again, and let her idle. The idle, just as Joe said, was good. He lifted the accelerator arm to feed her more gas, and immediately it died. Gus started and killed her again several times, trying to see what caused it.

[Continued on page 252]

# Presenting America's most SENSATIONAL saw VALUE...





## 8"TILT/ARBOR, BALL BEARING CIRCULAR SAW

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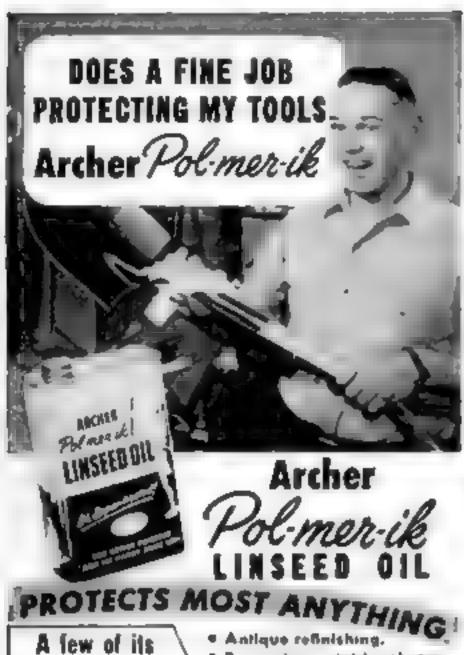
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#### Gus Answers a Fire Alarm

[Continued from page 250]

"Say, Gus. I don't know anything about engines, but is this distributor supposed to move every time you give it the gas?"

Gus left the engine idling and came

around to that side.

"Yes, that's normal, Your distributor moves back and forth with the retarding and advancing action of your timing apparatus. See, as soon as I lift the accelerator arm and give it gas, the engine speeds up and the ignition advances, the distributor turning with . . ."

#### Engine Speeds Up and Dies

Gus broke off and stared at the distributor as the engine speeded up and died.

"Well for crying— This makes me feel his an oil spot and twice as silly! Turn the ignition off, Joe, so I won't get jolted into next week!"

Gus loosened the bolts holding the coil and moved it closer to the distributor, tying it to the brace that ran from top of the radiator to the bottom of the fire wall.

"How's Sam doing?" he asked over his

shoulder.

"He hasn't put the fire out, but by golly he's got it under control!"

"Well, you can add your own hoses to the fight in just a minute."

#### Pump Settles Down to Work

Gus slammed the hood down, jumped up behind the wheel and hit the starter. The engine cranked for a moment, coughed and then burst into even, throbbing power. He saw the firemen jump for the hoses and when they were ready, he pulled the pump lever and saw the heavy streams of water begin slamming into the fire.

An hour later, the fire was out, and Gus got ready to go. insley stopped bim.

"Just for the record, what was wrong

with the truck?"

"Not much. See this short wire leading from the coil to the distributor? It's not the kind that's supposed to be there. You see, not all distributors turn as a whole with the advancing and retarding of the ignition. A lot of them do the turning internally and separately from the outside covering. And this wire was meant for that kind. See how rigid it is? Well, the constant flexing of the distributor body kept working on it until it snapped every little strand

[Continued on page 254]



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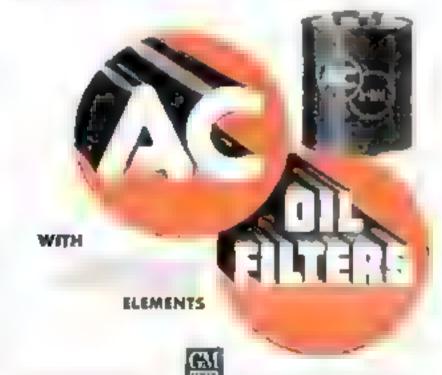
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#### Gus Answers a Fire Alarm [Luntinued from page 252]

in the wire. It broke right here at the terminal nut on the distributor.

The weird part about it is that when the engine is idling, and the distributor is at its full-retarded position, the wire is rigid enough to hold its position and maintain contact. When you give it the gas, the distributor pulls away from the wire, and the wire still standing up makes contact with nothing but air. I didn't see it, because when I checked over that section, it was touching and looked perfectly all right. And the cap can be removed easily without even disturbing the wire. Anyway, I brought the coil closer to the distributor because there wasn't enough slack in the wire to make a new connection. As soon as you get back to the station, get your maintenance man to locate a new wire, and the right kind . . . Say, where did Sam go?"

#### Gua Visita a Hospital Patient

"I guess you were too busy to notice. Not long after you got the engine started, the old codger collapsed. Little too much smoke in his lungs. He's down at the hospital getting treatment and rest."

Gus walked down to his truck, turned it around and headed for the hospital.

Sam Boise was somewhere on the outskirts of sleep when he saw Gus's face at the foot of the bed. The old boy did look pretty well bushed, but the nostalgia in his eves was brightened with happiness.

"Well, Sam, you got your wish after all

these years."

"Sure did. It was just like the old days. The old rig worked pretty good!"

"It sure did, Sam. If you hadn't come along, the block would have gone up."

"It all goes to show you," the old man chuckled.

"What's that, Sam?"

"The fickleness of engines. Get a horse!" Gus grinned and watched the old man drift off into a happy sleep.

"You just might be right at that, Sam." Gus turned and tiptoed out of the room. END

#### Definition

Motorist: A person who, after seeing a wreck, drives carefully for several blocks.-L & N Magazine.

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Wonderful Road We Never Finished

[Continued from page 102]

But the majestic sights beyond this point seem likely to be hidden from you for a long while.

Costa Rica can't close this gap alone. She needs U. S. help. And with economy the watchword in Washington, that help seems certain to be a long time coming.

Exasperating as it is to think that you've spent \$51,000,000 to be able to drive to Panama and still can't do it, don't think that the money has been thrown away.

#### Road Has Raised Living Standards

The U. S. national income, according to E. W. James, recently retired chief of the Inter-American Regional Office of the Bureau of Public Roads, has already gained more from the building of the completed stretches of the road than was ever taken out of it to build them. That is because improvements in local standards of living—producing more and more money to spend for U. S. goods—have followed the course of the road.

The only trouble is, you didn't get what you paid for, and it begins to look

as if you never will.

Given \$16,400,000 and political approval, the Guatemalan gap could be closed in from 18 months to two years, the Costa Rican gap in about three years. That, again, is according to Mr. James, who headed the Bureau of Public Roads' participation in the project from the day the route began to be laid out, in 1930.

Then, starting either at Laredo, Tex., or Nogales, N. Mex., you'd be able to load the wife and kids in the car and show them more than 3,000 of the loveliest miles on earth.

#### Tough Pose

LITTLE WILLIE dashed breathlessly into the drugstore.

"Quick!" he panted. "My father's hanging by his pants from a spiked fence."

"What can I do?" asked the druggist.

"Put a new roll of film in my camera," said Wilhe Pure Oil News.

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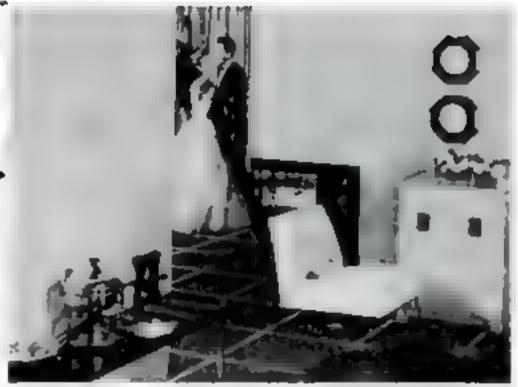


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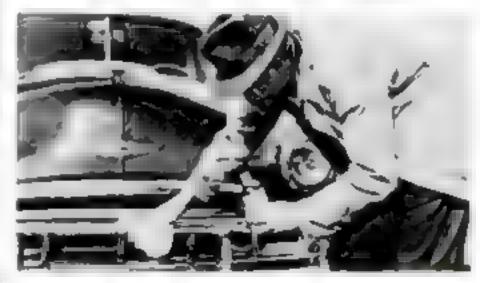
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## They Test Cooking in a Glass Stomach [Continued from page 197]

Ought we to eat our vegetables raw? "No," replies Dr. Horn, "but if you want to conserve their protein values, cook them with as little heat as possible. Cut down the cooking time if you can, but cutting down the degree of heat is 10 times as important." Dr. Horn suspects that the ideal cooking method, which he hasn't yet tested, will turn out to be electronic.

Now what? Since Horn is a scientist, his main job at the moment is to write a scientific paper explaining the Beltsville method in such detail that other scientists can put it to work. Inquiries about it, prompted by a Department of Agriculture announcement, have already come in from putrition authorities in food-processing companies and universities. The Army, too, has shown interest.

#### Canned Food to Be Tested

After that, Horn wants to complete the studies on fresh food, raw and cooked, and then get to work on food that's been stored or canned. There is some evidence that the longer a food is kept, the more of its amino acids are lost; Horn wants to check on that.

One of these days, the Beltsville group expects to help nutritionists draw up a chart showing the amino-acid content of all main foods—fresh and processed, raw and cooked. Then it will be easier for you to balance your proteins. And if anyone wants to use the glass-stomach method to test the protein quality of converted sawdust, cultivated algae, or anything else that might ease world food shortages, he is welcome.

#### It Gots Around

Mas. Brown was complaining to her doctor that the bill was too high.

"Don't forget," he reminded her, "that I made 11 visits to your home when little Johnnie had the measles."

"And don't you forget," she countered, "that he infected his whole class."—Fireman's Fund Record.

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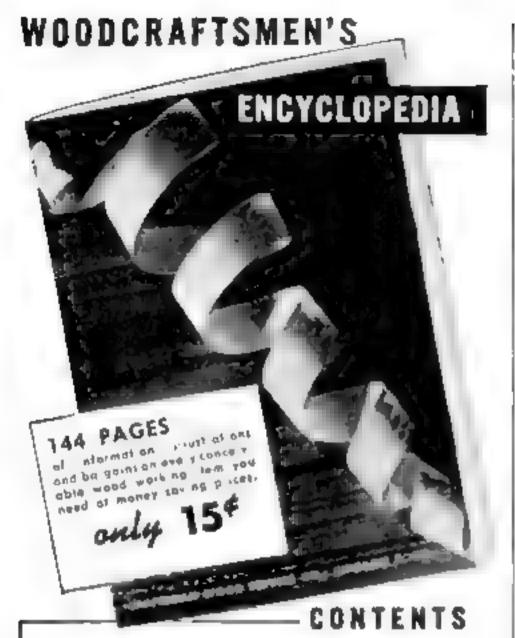
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## Scientists Tackle Pilots' Blind Spots [Continued from page 118]

silver, which blend in with the surroundings and are hard to see.

The use of rear-vision periscopes also is now being tested in jet fighters by the Air Force and the results are being eagerly studied by commercial and other civil aircraft owners. In England, the rear-vision periscope, extending up out of the forward part of the cockpit cabin, is already in use on many commercial

transport planes.

General cockpit design likewise is getting a going-over by a special industry-wide committee under the sponsorship of the Society of Automotive Engineers. Standard cockpit designs are being drawn up with the positions of the basic flight instruments and major controls so arranged that they require a minimum of eye and arm movement on the part of the pilot. According to the general standardization plans, each basic instrument will be placed in exactly the same position in all airplanes of a general type.

#### Flying Regulations to Be More Rigid

More important, the Government's air-safety experts are drafting a threatened stiffening of flying regulations to cut down the likelihood of mid-air collisions. "Unexplained" and inexcusable in-flight crashes like the one that occurred last summer over Indiana must stop, they warn, and they're ready to crack down on private fliers and airlines alike.

The 57 passengers in the Indiana "brush" collision were just lucky. In 34 of the 86 in-flight collisions during the last five years, 175 other people weren't so lucky. They were killed.

#### Too Easy

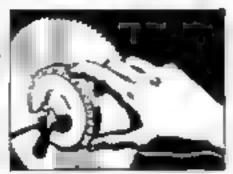
A course with a new baby and a toddler were listening to a television salesman enthuse over a new model "... and it's so simple a baby can turn it on."

That was the clincher for the husband, who remarked to his wife, "Guess we'd better wait till they make them more complicated."—Indiana Tele News.

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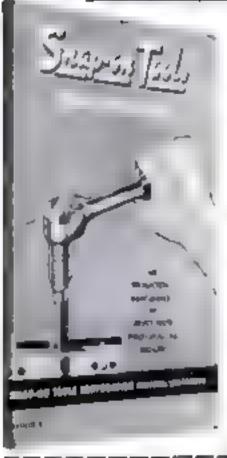
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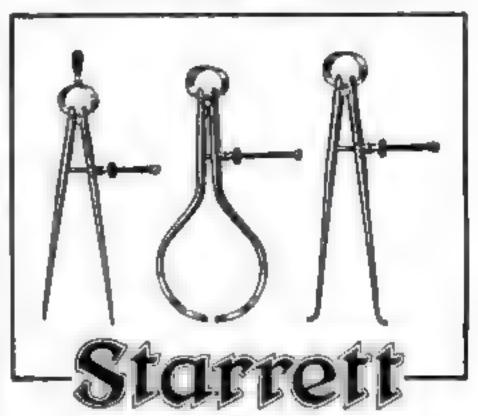
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#### 161 Chevrolets . . . All Different [Continued from page 126]

er's attention. They must also compete with chi-chi models like hardtops and with various lines or "series." As among the brands, decision has to be made on the kind of fishtails on the rear fenders and wind-splits on the front ones. The number of choices that has to be made before the money and the car change hands is getting so huge that the emotionally unstable buyer had best stay out on the sidewalk, point through the window and settle it by saying, "Gimme that one.

#### Sorry, No Agnes Pink

Chevrolet won't be making any Agnes Pink automobiles in 1954. It won't even change its basic sheet metal from 1953. But the cars will get away from a light faster and—a point vital to the fellow who is fiddling with the notion of buying a new car-they will look different.

Engine power is up. Compression ratio is up. A new camshaft has been installed. Power plants are quicter. Carburetors are changed for smoother acceleration. There's a new muffler and nylon inserts for the rear springs, eliminating the need for spring covers and for lubrication.

Power brakes will also be available for 1954. They are the low-pedal type, made by Bendix.

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And colors! Nine of the 14 exterior colors are spanking new. So go down to the showroom and make your choices: Solid color? Two-tone? Hardtop? Sedan? Station wagon? What line, the Bel Air? What transmission, a standard or automatic? What tires, plans or whitewall? Want power steering? An electric front-seat adjustment? Automatic window lifts? Wheel covers? Turn signals? Backup lights? Or perhaps a stationseeking radio?

On second thought, you'd better make out a check list and sit down and talk it over with the little woman. It will save you trouble. END



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## Educated Gas Pedal Keeps Cops Away [Continued from page 169]

his position often, and permits him to concentrate wholly on steering.

A less important criticism turns on the fact that most drivers, while running on automatic, tend to postpone unlatching it until the last moment. As you close up on a slightly slower-moving car ahead, you postpone touching the brake on the hope that he'll turn off the road or pick up speed, sparing you the trivial chore of unlatching and latching up again. A single medium-sized scare corrects this tendency.

How much? Pierce Governor doesn't know, at this writing, but hopes to "come near the price of a good auto radio." Presumably this means under \$100, but not by much. One reason for the uncertainty is that the company plans to sell the device to car manufacturers, for use as a factory-installed extra, rather than directly to you, with all your headachy installation problems, Several makers are reported to be dallying with Speed-o-Stat.

The device will probably come in several versions. Besides the one described here, there may be a model without automatic speed-holding—it'll give you a firmed-up accelerator but won't latch in. A third type will appeal to the fathers of kinds having a taste for speed: Pop will be able to set maximum speed by key.

Considering that Junior would be smart enough, in many cases, to drive off docilely and stop under a lamppost down the street to pull off a vacuum hose, Pierce knows that Junior-proofing will take redesign. But by using lead scals, they figure they can make it so Pop can always tell if Junior jumps it.

#### Admonishment

A FRIEND reports that a few evenings ago, in a traffic snarl, one of the inevitable horn-tooters began blasting his horn.

A man in a car alongside looked over and politely inquired: "What else did you get for Christmas?"—Viking Vacuum,



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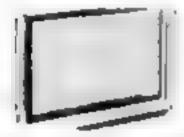
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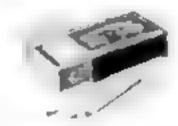
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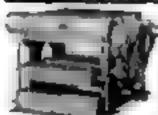
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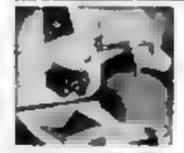
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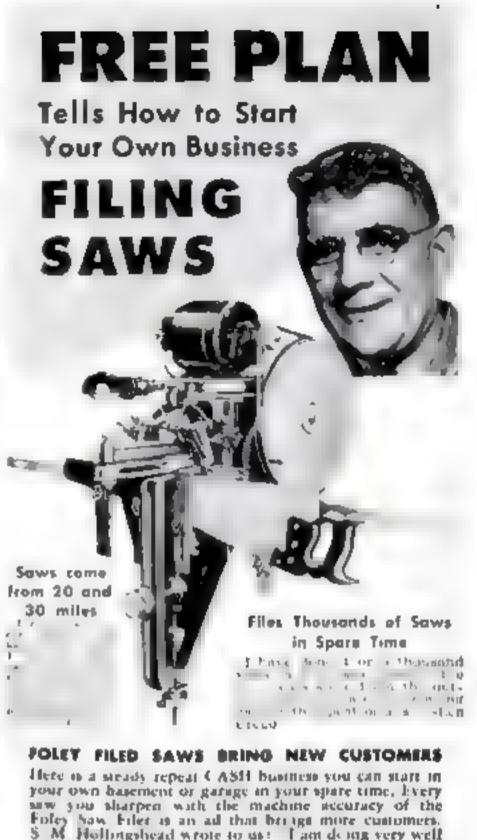




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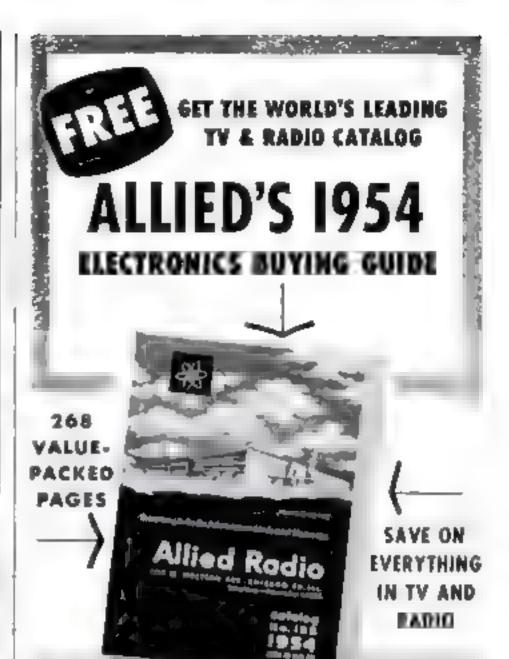
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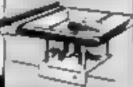
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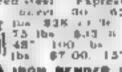
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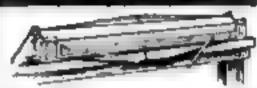
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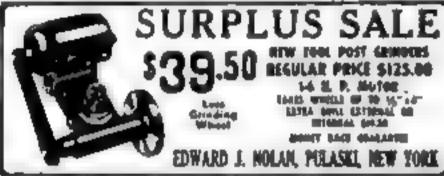
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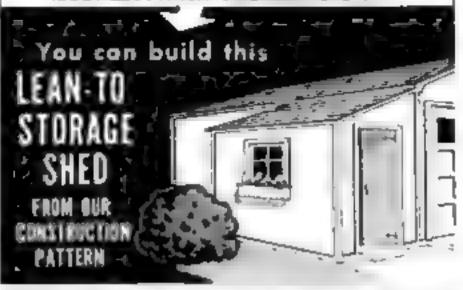
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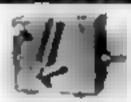
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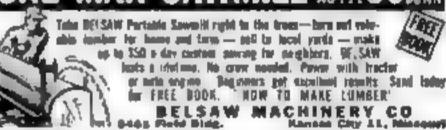
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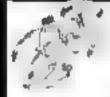
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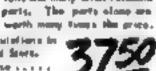
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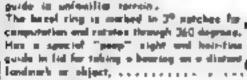
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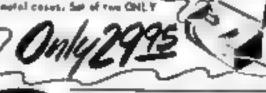
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#### The World's Biggest Devillish

[Continued from page 104]

and everyone, young and old, grabbed the rope and tried to pull the ray over the sand. No success.

Oil-company trucks came along. The rope was attached to the rear axle of one. Men and truck pulled. Together, they got the ray up a couple of feet on the sand.

The truck looked as if it were about to fall apart. It was detached from the load,

and departed.

Logs and lumber were put under the ray. Another truck, plus men, got him up 10 or 15 feet more. The second truck was forced to quit.

A third truck, with everyone in sight also pulling, finally got the ray well up

on the beach.

#### Sea Moves In

Then Migdalski went to work pouring

the plaster for his molds.

The tide started coming in. Migdalski realized it would roll over the ray, plaster and all.

"I was ready," he recalls, "to give up

for the tenth time.

"But everybody got busy and built a dike of sand around the ray. The dike was three feet high, and completely surrounded him except where it met a high bank at the back. The day, and the ray, were saved."

Laboring under the broiling sun, which he now felt, Migdalski took two and one-half days to make plaster molds of the ray. He got one break. "Despite the sun," he says, "the ray didn't smell." The molds were so large they could not be loaded onto the Suzanne V or any of the U.S. fishing vessels in the vicinity. They had to be shipped to Yale aboard a freighter.

For the ray measured 18 and one-half feet across—from wing up to wing up.

#### Biggest Ray to Tip Scales .

He weighed over 3,300 pounds—well over one and one-half tons. He was the largest ray ever weighed. He was one of the largest rays ever caught—very possibly the biggest. Records are being checked.

And the devilfish was not weighed until he had been cut into pieces, and therefore had lost some of his body fluid and had become dehydrated by being out of the water. That means the manta was at least a couple of hundred pounds heavier when Migdalski & Co. were fighting him.

#### Ray Outshone Other Record Catches

It is interesting to compare this Yale catch with some other big ones. The record white shark, and the biggest catch by any means listed in the World Almanac, 2,333 pounds, was taken off South Australia in 1952. The record tuna was 1,800 pounds; the heaviest marlin, around 1,200; the biggest sawfish (which is itself a ray), 1,500; the record swordfish, over 1,000. Only a few catches in history—of such things as the whale shark, the 50-foot-long largest of fishes—are bigger than Yale's.

Migdalski wasn't out after the biggest

ray. Didn't want him, in fact.

He wanted a manta small enough so he could catch him, haul him in and mold him with a reasonable amount of work.

But since the afternoon was getting along—it was, you remember, three o'clock when the ray was sighted expedition leader Wendell Anderson told Migdalski he'd better attack this one or he wouldn't get any.

That was why, although the party had spotted five or six rays that afternoon, Migdalski went after this one but hadn't

chased any of the others,

"I thought they were too big," he says, "and turned them down." END

#### **A Meaty Question**

A costomer complained to the waitress that his soup was too watery, his bread too stale, the butter too salty, etc. Finally he said, "And when you order that chop, make it lean."

"Yes, sir." said the girl. "Which way?" The

Right Hond.

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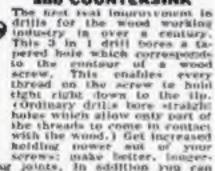
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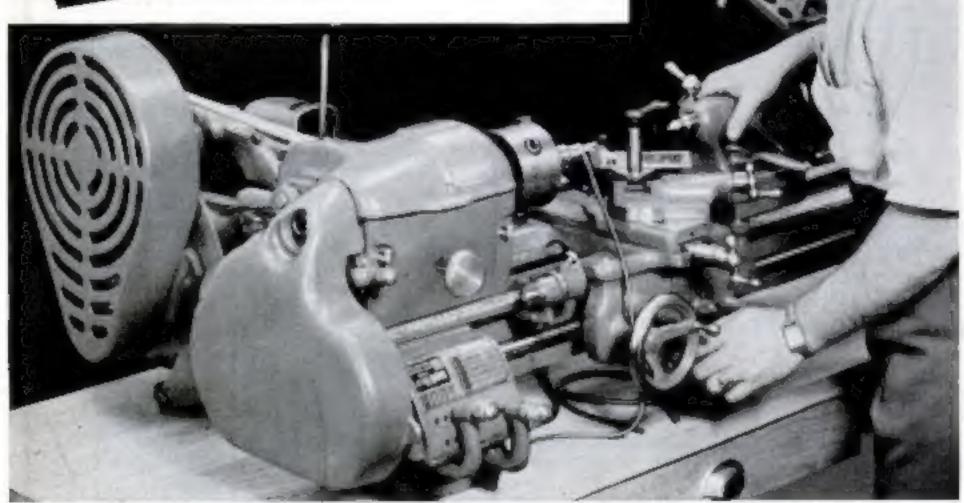
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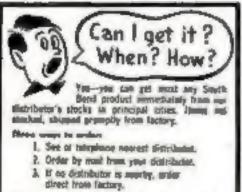
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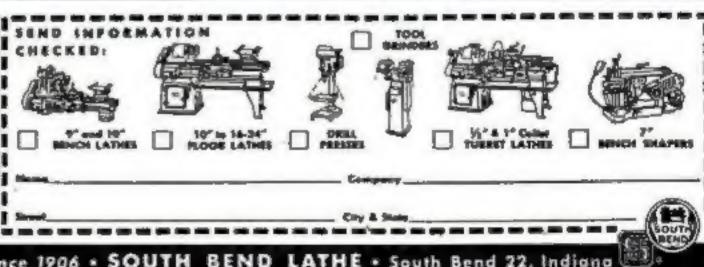
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